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OUR WORLD TO-DAY

A Modern Geography

BY

W. R. KERMACK, B.A., F.R.G.S.

*Containing Eighty-eight Maps and Diagrams
and over Four Hundred Exercises*



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PREFACE

THE aims of Geography teaching in the Primary School are to quicken interest in, and in some measure to explain, the immediate environment of the child ; and to awaken, by the description of the more picturesque aspects of conditions different from his own, a curiosity concerning other parts of the world.

The purpose of this text-book is to supply material for the more systematic study of the World suited to pupils in Post-Primary Schools. Its distinctive features are :

- (1) Three Introductory Chapters which deal generally with the Physical, Commercial, and Human aspects of Geography. After a statement of man's needs follows a broad treatment of climate, which in turn leads to a discussion of the reaction of man to his physical circumstances. The main features of these chapters should be (a) thoroughly grasped before proceeding to the reading of the remaining chapters, (b) used for reference in the study of the Continents, (c) utilised as the basis of a fuller survey of the World's resources undertaken after a first reading of the whole book.
- (2) Seven Chapters dealing with the Continents and the British Isles. These are treated regionally, and in such manner as allows of their being taken in any order ; but advantages accrue from following the order given, though it is not the traditional one. In particular, the New World shows more strikingly than the Old the working of climatic controls and the development of physical resources by human intelligence. Asia and Europe in general present problems to the youthful mind, consideration of which is probably best reserved until as late as possible in school life.

- (3) Although there is no separate treatment of the British Empire, its parts are dealt with in the Continental chapters as separate units and in considerable detail.
- (4) Throughout the story is of human development, as exemplified by the adjustment of man's activities to his geographical environment, and the inter-relations of Geography and History have not been neglected.
- (5) The method followed is scientific and rational. It is hoped that it will lead to pupils asking questions as to the why and the wherefore of the facts set before them.
- (6) To provoke and to encourage thought, a very comprehensive set of exercises has been devised. Some of these entail map and memory work ; many are intended for class discussion after individual preparation. Many will also be found useful as the apparatus of revision, either before or during the final year of school life.

The author is deeply indebted to Mr. James Thomson, M.A., Headmaster of Sunnybank Intermediate School, Aberdeen, who suggested the general lines upon which the book has been written, read and re-read the typescript, and made many suggestions regarding both matter and phrasing. Assistance second only to that of Mr. Thomson has most kindly been rendered by Mr. Alexander Ellis, M.A., of the same school, who, in addition to his criticism of the text, has prepared many of the exercises.

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W. R. K.

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OUR WORLD TO-DAY

CHAPTER I

THE INFLUENCE OF CLIMATE

WHAT IS COMMERCE ?

MEN and women, wherever they live, must be able to satisfy their five great needs : food, clothing, shelter, fuel, and implements. Sometimes they obtain these from the resources of their own neighbourhood. More usually they produce for sale some article in larger quantities than they themselves require, and with the money thus received buy from another district those commodities of which they stand in need. This process of exchange between districts that produce different commodities is **Trade**. The goods purchased are conveyed from the district where they have been produced to the district where they are to be used. This process is **Transport**. Trade carried on by means of Transport is what we mean by **Commerce**.

Nowadays bulky goods, such as coal and wheat, and perishable goods, such as meat and butter, can be carried so speedily over great distances, that the tendency is for countries to specialise in supplying commodities which they can produce in greater quantities and more cheaply than others. Modern Commerce is thus mainly concerned with large quantities of a relatively small number of commodities, namely :

- (a) Food for the populations of districts that specialise in manufacture ;
- (b) Raw materials for the factories of these districts ;
- (c) Manufactured articles for districts that specialise in the production of food and raw materials ;
- (d) Fuel—coal and petroleum.

THE FIVE HARVESTS

Man on the earth has Five Harvests that he may reap. These are the Harvests of the Surface of the Earth, of Animals, of the Rocks, of the Waters, and of the Air. According to the use that he has made of these in the past, he has reached different degrees of civilisation in different parts of the earth. Upon the use that he can make of them in the future depends the degree of civilisation that he may hope to reach. From one or more of these Five Harvests every place makes its contribution to the Commerce of the world.

(1) **The Harvest of the Surface of the Earth.** Dry land occupies more than one-quarter of the globe ; and almost the whole of this area, except those regions that either have no moisture or are covered with ice, has some kind of vegetation. This " Natural Vegetation " has been improved by man's skill. By means of cultivation he has secured greater returns of the crops of which he stands most in need than are reproduced by the unaided processes of Nature. Man's need has brought it about that the main products of the Harvest of the Surface of the Earth are due to **agriculture**.

(2) **The Harvest of Animals.** Besides yielding crops to man, vegetation also feeds all animals, either directly, when they graze it for food, or indirectly, when the " Eaters of Grass," as Kipling calls them, become the prey of the " Eaters of Flesh." We may say that animals (in which term we include birds) convert grass and other types of vegetation, which man cannot eat or use, into meat, milk, eggs, hides, wool, and other products, which are of service to him. In addition, he makes use of animals to assist him in Transport and Agriculture.

(3) **The Harvest of the Rocks.** This Harvest is reaped both from those rocks which appear at the earth's surface, and those which lie beneath. In the first place, it is from the rocks, dissolved into fragments by the action of air and water, that soil is formed. Man can also make

direct use of the rocks. He can mine salt for food, fashion pottery from clay, build a house, roof it with slates, and warm it with coal. He can adorn himself with ornaments wrought from silver and gold, or with rare and beautiful stones, such as diamonds. He can use gold, silver, and other metals as coins, to represent standards of value, and to act as a medium of exchange.

Further, water percolates through upper rocks to others deep-seated in the interior of the earth. There it becomes intensely heated, and forces its way upwards. Owing to its great heat, it dissolves any particles of metals with which it comes in contact, and, when it cools at the earth's surface, deposits the metals as mineral ores. From these man has learned to fashion all manner of machinery; and from his Harvest of the Rocks he has obtained also in coal and petroleum the means of generating power to drive his machines.

(4) **The Harvest of the Waters.** Water is a necessity of life, not only for man but for animals and vegetation. At a very early period of history the peoples of Egypt and Mesopotamia had learned that by irrigation canals they could bring water, and the fertilising mud that it carried, to land that otherwise could not bear a crop. From early ages, too, rivers and seas have been highways for Transport. To-day they are more than ever important for this purpose, because the cheap and bulky commodities that Commerce mainly handles are carried more easily over water than on land. In the third place, under certain conditions water can be used to generate electricity as a source of light and power.

The waters also yield a direct Harvest from fisheries. Fish perform the same service for man in the waters that sheep and cattle render upon land, because they convert the vegetable life of the waters into flesh that is a food for man. In comparison with the Harvest of Animals, however, this Harvest is only of slight importance as a source of food. The fish taken all over the world are of less market value than the poultry and eggs produced in the United States.

(5) **The Harvest of the Air.** The envelope of the atmosphere in which the earth is enclosed is a mixture of several different gases. Nitrogen and oxygen are present in the greatest proportions, carbon dioxide and other gases in lesser quantity. The atmosphere also contains varying amounts of water vapour and of dust. We have mentioned the formation of soil as a product of the Harvest of the Rocks ; but without the atmosphere there could be no soil. Oxygen and carbon dioxide, along with the water vapour in the atmosphere, attack the rocks and break them into powder. Without the atmosphere there could be no life ; for alike in plants, animals, and man, life depends upon the breathing in of air, the absorption of oxygen, and the giving out of carbon dioxide. Further, oxygen, nitrogen, and carbon extracted from carbon dioxide build up the tissues of which the bodies of plants, animals, and man are composed. The chemist and the electrical engineer have made possible the extraction of nitrogen from the air, and an abundant supply of its compounds as a fertiliser for agriculture. The condensation of water vapour upon the motes of dust in the atmosphere forms clouds, which produce rain.

In the second place, until the nineteenth century, currents of air, that is, winds, were the main source of power to drive ships ; and the Wind Belts of the globe determined the main routes of navigation before the invention of coal and oil-burning vessels. On land, wind has been utilised since the Middle Ages to turn the sails of windmills. Thirdly, in our own times the air itself has become a highway for aircraft, while by the invention of radio-telegraphy and telephony it has been brought into use as a medium of communication.

TEMPERATURE ZONES.

We have already noticed that Trade depends upon a difference between the products of different districts. That such differences exist is due to the fact that all places do not share equally in the Five Harvests. In the case of all

these Harvests, except that of the Rocks, the main factor that causes this inequality is climate. Climate means average weather conditions over a region, and includes temperature and moisture. These are influenced by latitude, altitude, and distance from the sea.

Latitude and Temperature. The earth obtains heat from the sun's rays. That part of its surface which is struck by direct rays receives the greatest amount of heat, while less and less heat is received by those parts which are struck by rays that slant more and more steeply; for the slanting ray is required to heat a greater surface (Fig. 1, *c-d*), and therefore does it less efficiently than at *a-b*. If the Earth travelled round the sun revolving at the same time on a perpendicular axis, that is, with the sun always

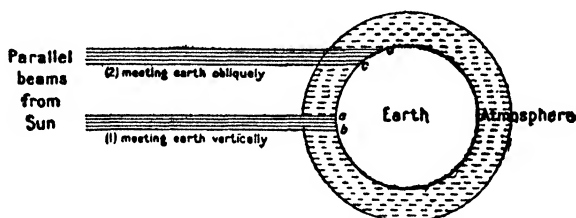


FIG. 1.—Direct and Slanting Rays.

directly above the Equator, the amount of heat conveyed from the sun would decrease uniformly from the Equator towards the Poles.

Actually, however, the Earth revolves on an axis which is inclined (or leans over) at an angle of $23\frac{1}{2}$ degrees from the perpendicular. Therefore the sun's direct rays, instead of striking the Equator throughout the year, actually strike for half the year (Northern Summer) some part of a belt of the Earth's surface which extends from the Equator to a line $23\frac{1}{2}$ degrees north of it, and for the other half of the year (Southern Summer) strike some part of a belt which extends from the Equator to a line $23\frac{1}{2}$ degrees south of it. We speak of this as "the apparent movement of the sun." Because all places in these two belts have the sun directly overhead, and therefore receive its direct rays, during part

of the year, they are hot regions, and together are known as the **Torrid** (or Hot) **Zone**. The northern and southern limits of this zone, $23\frac{1}{2}$ degrees north and south of the Equator, are called the **Tropics of Cancer and Capricorn** respectively (Fig. 2).

Because each end of the earth's axis is turned towards the sun for half the year, and is turned away from the sun for half the year, every place that lies within the $23\frac{1}{2}$ degrees south of the North Pole is struck by the sun's rays for six months, but for the remaining six months is cut off from them. The same thing happens in the case of every place within the $23\frac{1}{2}$ degrees circle north of the South Pole.

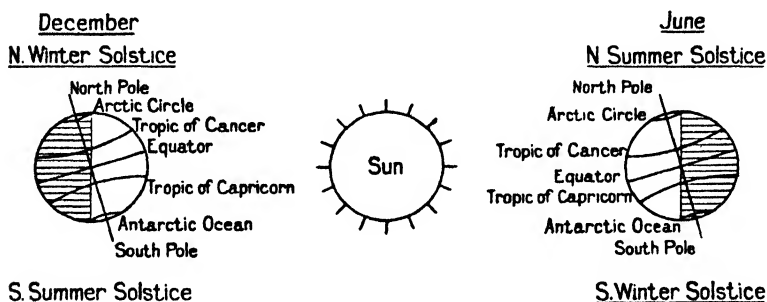


FIG. 2.—Inclination of the Earth and the Sun's Rays. The shaded areas show halves of the earth turned away from the sun.

During the six months that the cap round the North Pole is receiving heat and light, the cap round the South Pole is experiencing cold and darkness. Thus the months of "**northern summer**" north of the Equator are those of "**southern winter**" south of the Equator. Further, even during the six months of Polar summer, only steeply slanted rays strike the area. These two areas round the North and South Poles never, therefore, receive much heat, and are known as the **Frigid** (or Cold) **Zones**. Their boundaries, $66\frac{1}{2}$ degrees north and south of the Equator respectively, are termed the **Arctic and Antarctic Circles**.

Between the Torrid Zone and the Frigid Zones are two belts in which no place ever has the sun directly overhead,

but in which every place receives rays which slant more or less during the year. These are known as the **North and South Temperate Zones** (Fig. 3).

We may sum up the main contrasts in temperature between these three types by saying :

(1) Places in the Torrid Zone experience a temperature, averaged over the whole year, of over 70 degrees Fahrenheit. This is the limit of growth of tropical plants, such as the date palm and the banana. There is little difference in average temperature from month to month, but a great difference between the temperatures of day and night.

(2) Places in the Temperate Zones experience a temperature of at least 50 degrees for the warmest month. This isotherm (or line of equal temperatures) is approximately the poleward limit of cereal grains and forest trees. There is a great difference between summer and winter temperatures, the warm summer and the cool winter being separated by the less extreme temperatures of spring and autumn.

(3) Places in the Frigid Zones experience a temperature which is never higher than the average of 50 degrees for the warmest month, while they have a long, cold, dark winter.

If we place on a map the annual isotherms of 70 degrees F. and the summer isotherms of 50 degrees F., we see what are the actual limits of these Temperature Zones (Fig. 4), and can compare them with what their limits would be if they depended only on latitude (Fig. 3). The differences between these two figures are due to the fact that land is warmed and also cools more quickly than water which receives the same amount of heat from the sun. The different effects of the sun's heat upon the land and sea cause the summer isotherms of 50 degrees F. to bend away

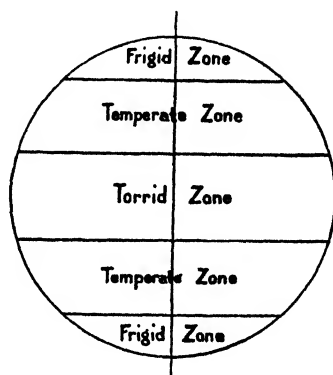


FIG. 3.—World Temperature Zones (according to latitude).

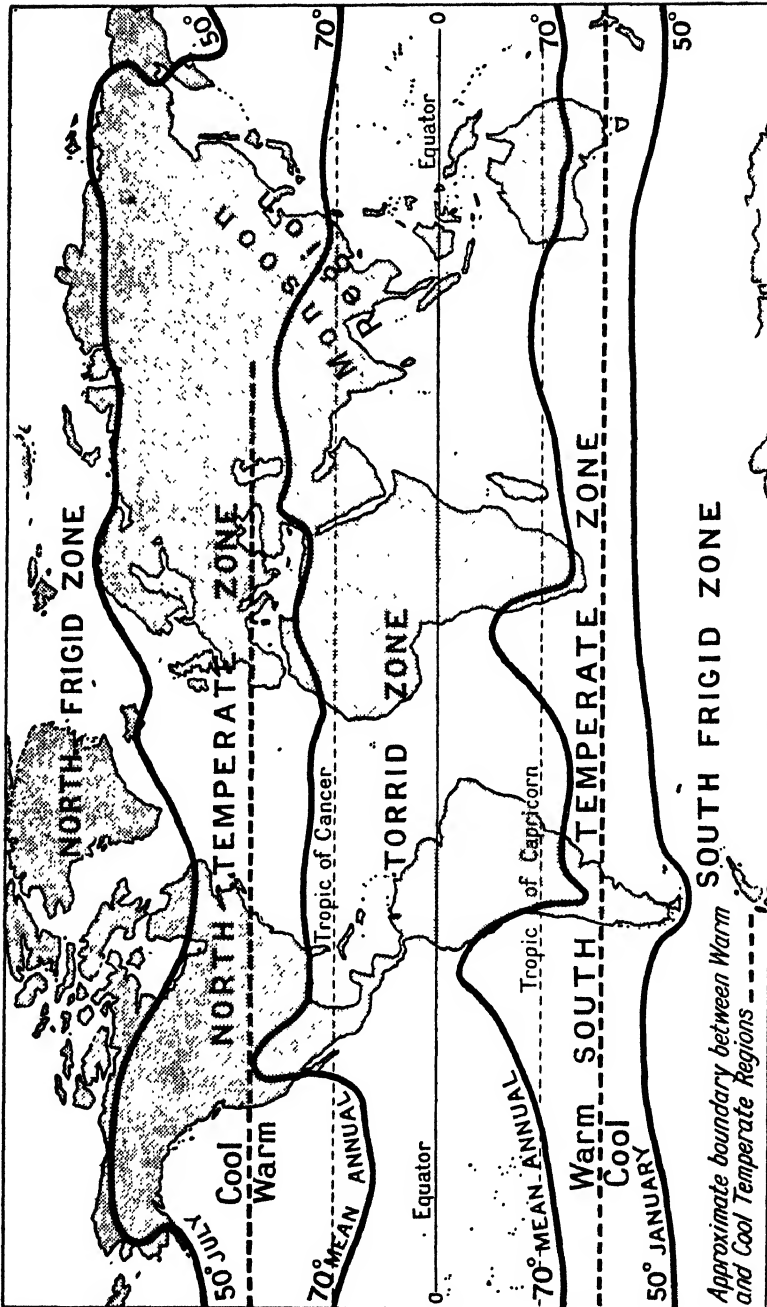


FIG. 4.—World Temperature Zones (Actual).

from the Equator over the continents, and towards the Equator over the oceans. Most of the Torrid Zone is a water surface, so that the course of the annual isotherms of 70 degrees F., which mark its limits, follow parallels of latitude fairly closely ; but the fact that the land areas in this zone heat up in summer to a greater extent compared with the oceans than they cool down in winter has the effect of causing the annual isotherms over the land to bend polewards away from the Equator.

Altitude and Temperature. The temperature of the air is raised chiefly by its absorption of heat radiated by heated land and water surfaces. The lower the layer of the atmosphere, the greater is the amount of radiated heat absorbed, because the lower layers of the atmosphere contain larger proportions of water-vapour and carbon dioxide, which increase their power to absorb heat, and because the presence in those lower layers of cloud, mist, and fog interferes with the radiation of heat to upper layers.

In consequence, the temperature of the atmosphere falls at the rate of 1 degree F. for every 300 feet of ascent. Thus at every latitude there is some height in the atmosphere at which the temperature is more often below 32 degrees F. than above it, so that less of the snowfall on land above that height melts than remains frozen. This boundary above which the greater part of the snowfall does not melt is known as the **snow-line**. It lies at sea-level in the extreme polar regions, and at 16,000 feet at the latitude of the Equator.

EXERCISES I

A

1. (a) What are the five needs of man ?
(b) Compare the requirements under each need of a Briton living at home and of a native of Central Africa, or Ceylon, or New Guinea.
2. Make out lists of the chief imports and exports of your own town or district, grouping them as (a), (b), (c), and (d) on p. 7. Whence come the imports, whither go the exports ?

3. Catalogue these commodities as "Harvests"—salt, bread, coal, timber, wool, leather, petroleum, pen-points, inkwells, paper, milk, fish, wireless, linoleum, silk, artificial silk, pennies, porridge, bacon, eggs.
4. Describe a circle, and in it draw lines to show the different temperature zones, giving the average temperature and a typical vegetable product of each.
5. What is the snow-line? Why is it at an altitude of 5000 feet in Norway and 9000 feet in Switzerland?

B

1. What is meant by the Five Harvests? Which Harvests does man reap most profitably in the district in which you live? Give examples.
2. Taking (a) the food you eat in any day, and (b) your home and its furniture, refer the parts to the Harvests mentioned in the text.
3. Discuss the contribution of each Harvest to (a) lighting, (b) power, (c) transport.
4. Why is it that the fact that the axis of the earth is inclined at an angle from the perpendicular results in a division of the earth's surface into five Temperature Zones? Name these Zones, and define their limits.

WIND BELTS

Rainfall as well as temperature, however, determines climate. Rain is received from moving currents of air, that is, from winds. We must therefore consider the distribution of the winds of the globe.

When Columbus sailed from the Canary Islands in search of a new route to Asia, he knew that his ships would be driven on their outward voyage by **north-east** winds that blow away from Europe across the Atlantic. But farther north he found **south-west** winds blowing towards Europe, and these winds brought him home. A century later, it was found that similar north-east and south-west winds blow in the northern Pacific Ocean.

South of the Equator, Magellan, after he made the passage of Magellan Strait, found such steady and gentle **south-east** winds to drive his fleet towards the Philippines that he named the ocean "Pacific." Very different was

the experience of Bartholomew Diaz, who met with such rough **westerly** winds when he rounded the Cape of Good Hope that he called it "the Cape of Storms"; while, off the southern extremity of South America, Drake, after passing through the Strait of Magellan, was driven by westerly storm winds south of Cape Horn back into the Atlantic.

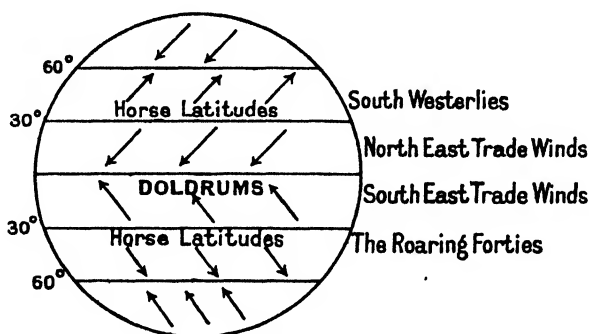


FIG. 5.—Wind Belts.

By practical experience, then, seamen learned of the following wind system :

- (i) North-east winds north of the Equator as far as about 30° N. latitude.
- (ii) South-east winds south of the Equator as far as about 30° S. latitude.
- (iii) South-west winds on the (north) poleward side of the North-east winds.
- (iv) North-west winds on the (south) poleward side of the South-east winds.

Because the North-east and South-east winds blow "trade," that is, direct, they were called **Trade Winds**, the **Westerly Winds** (iii. and iv. above) being sometimes termed "Anti-trades." The great force of the South-west winds about latitude 40° S., where it is very little broken by land, brought these winds the name of "the Roaring Forties."

It was found also that the Trade Winds died away near the Equator in a belt of calm air, constant rainfall, and hot, depressing atmosphere, and that two belts of variable breezes

lay on the poleward margins of the North-east and South-east Trades. The equatorial belt of calms, where vessels might lie helpless for weeks without a breath of wind to fill their sails, became known as the **Doldrums**, while the two belts of calms about 30° N. and S. were named the **Horse Latitudes** (Fig. 5).

PRESSURE ZONES

Meanwhile men of science had learned that the atmosphere exerts pressure, that the amount of this pressure can be measured, and that it varies from place to place and from day to day. They found that wind always blows from a region where the atmosphere is dense to one where it is less dense, that is, from a high pressure area to a low pressure area. As the Trade Winds blow from the Horse Latitudes to the Doldrums, it follows that the Horse Latitudes are areas of **high pressure**, and the Doldrums an area of **low pressure**.

Actually the pressure zones, like the temperature zones, are interfered with by the presence of great masses of land. Pressure remains low throughout the year near the Equator. In the North Temperate Zone, however, the land is colder than the sea in winter and warmer in summer. Air in contact with a warm surface becomes heated, expands upwards, and becomes less dense. Similarly, air in contact with a cold surface becomes chilled, contracts, and becomes more dense. Hence during northern winter very high pressures prevail over the interior of Asia and North America, and low pressures over the North Atlantic in the neighbourhood of Iceland and over the North Pacific round the Aleutian Islands near Alaska. In summer both the Icelandic and Aleutian low pressure areas shrink in size, and retreat polewards; pressure becomes low over Asia and North America; and high pressures prevail over the North Atlantic in the neighbourhood of the Azores, and over the North Pacific.

South of the Equator the land masses are smaller, and do not become cold enough in winter to create much higher

pressures in the atmosphere over them than the pressures that prevail over the oceans. During southern winter, therefore, a belt of high pressure extends along the Tropic of Capricorn round the globe. During southern summer the atmosphere becomes warmed up over the heated continents, pressure is lowered over the lands, and the high pressure belt of winter breaks up into three parts, one over each ocean.

EFFECT OF EARTH'S ROTATION ON WIND DIRECTION

Because the earth is a sphere which revolves on its axis from west to east, all places on the Equator are moving faster than any place elsewhere on the earth's surface, and the farther poleward a place lies, the more slowly it is moving. Hence winds, starting to blow from Horse Latitudes towards the Equator, lag behind the movement of that part of the Earth over which they are blowing, and appear to come from an easterly direction. Similarly winds starting to blow from Horse Latitudes towards the Poles outpace the movement of that part of the Earth over which they are blowing, and appear to come from a westerly direction.

WARM AND COOL TEMPERATE REGIONS

We have thus (Fig. 3) a system of Temperature Zones over the globe, within which the sun's direct rays appear to move northward and southward across the Equator in the Torrid Zone. We have also (Fig. 5) a system of Wind Belts, extending polewards on either side of a low pressure belt—the Doldrums. The two systems are linked together by the fact that it is intense heating of the atmosphere in contact with the Doldrums belt, struck by the direct rays of the sun, that produces the low pressure belt of the Doldrums. It follows that when the sun's direct rays appear to move northward or southward, the low pressure belt moves also, and that when the Doldrums move, say, towards the North Pole in northern summer, the North-east Trade Wind belt moves northward so as to invade what in winter is the belt of the Westerlies.

This has the important result that there are two zones round the globe, on the poleward side of latitudes 30° N. and S., across which the Trade Winds blow in summer, but which fall within the belt of the Westerlies when the sun retires across the Equator in winter. These belts are called the **North and South Warm Temperate Regions**, while the remainder of the Temperate Zones, within which the Westerly Winds blow constantly, are the **North and South Cool Temperate Regions** (Fig. 4).

THE MONSOON REGION

In one part of the globe this distribution of wind belts does not prevail. The huge land mass of Eurasia becomes bitterly cold in winter. In consequence atmospheric pressure becomes high, and from this area winds blow outwards in all directions. Similarly in summer the land mass becomes intensely heated. This creates an area of low atmospheric pressure, into which winds blow landwards from the sea. Winds thus reversed with the seasons are called Monsoons ; and that part of Asia in which they prevail is termed the Monsoon Region (Chapter VIII). To some extent this monsoon effect is found in different parts of the Earth wherever large land masses occur.

OCEAN CURRENTS

The winds affect the surface waters of the oceans by keeping them in motion as a system of wide, shallow streams, or currents. This system is naturally similar to that of the winds, with the difference that ocean currents must turn aside when they meet the obstacle of a mass of land, while air currents can rise to clear it.

The North-east and South-east Trade Winds drive westward across the Atlantic and Pacific Oceans two huge masses of surface water, which are warm because of their exposure to nearly direct rays from the sun. These North and South Equatorial Currents meet the eastern shores of the Americas, Asia, and Australia. A certain amount of the water at once escapes back as Counter Currents in

the region of the Equator ; but the bulk of the water is turned northward or southward along the shores of the continents into the belts of the Westerly Winds. These drive it back across the oceans towards the western coasts of Europe, Africa, and the Americas. There the currents

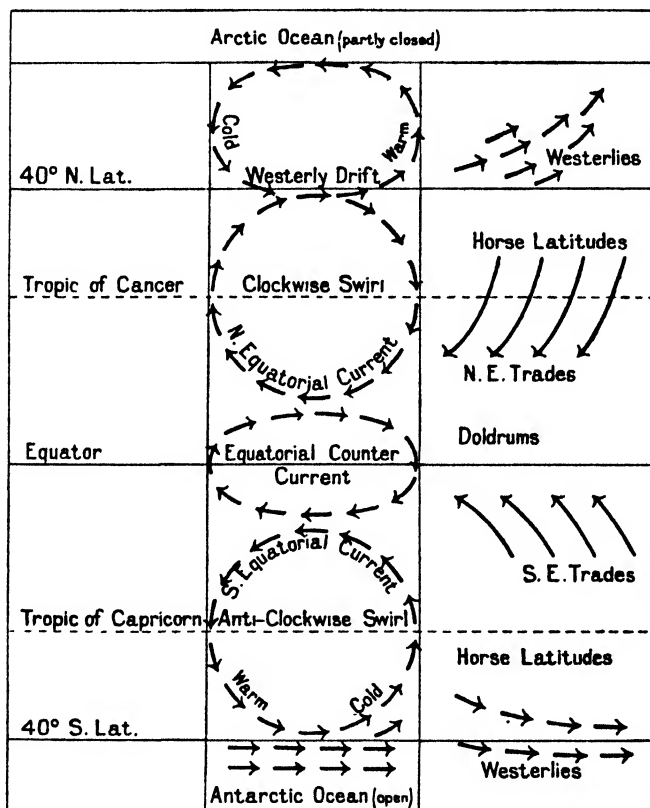


FIG. 6.—Ocean Currents.

again divide, part of their waters branching polewards to circulate round the Poles, while the main currents turn equatorwards along the coasts of the continents to rejoin the Equatorial Currents. Thus a swirl of surface water takes place in the oceans north of the Equator in the direction that the hands of a clock move, and an anticlockwise swirl takes place in the oceans south of the Equator (Fig. 6).

The water which flows polewards along the eastern shores of the continents has been heated by almost direct rays from the sun, and warms winds which blow landward across it. These winds make milder the climate of the lands they first reach. Westerly Winds, blowing across this poleward-flowing water in the North Atlantic and the North Pacific, bring notably mild winter temperatures to western Europe and north-western North America. The water which flows equatorwards along the western shores of the continents has been chilled by its visit to high latitudes ; but, except on the south-west coast of South America, this does little to chill the climate of these lands, because generally the prevailing winds blow from the land seaward.

EXERCISES II

A

1. Explain Doldrums, Roaring Forties, Anti-Trades, Monsoon, Equatorial Currents.
2. What is meant when we say " the barometer is rising (falling) " ? Explain why " a falling barometer " is usually a sign of unsettled weather.
3. (a) What is meant by " northern " and " southern " summer ?
(b) Why should pressure be high in northern winter over the continents of Asia and North America, and in northern summer over the North Atlantic and North Pacific Oceans ?
4. Arrange in three columns, lists of (a) the Temperature Zones, (b) the Climatic Regions into which these are divided, (c) the Wind Belts within which each Climatic Region falls.

B

1. Why did Spanish galleons trading between Manila in the Philippines and North America sail westwards from Acapulco in Mexico ($16\frac{1}{2}^{\circ}$ N. latitude) and return eastwards to Cape Mendocino in California (40° N. latitude) ?
2. Explain why certain parts of the globe experience Westerly Winds in winter and Trade Winds in summer.
3. On a map of the world show by means of arrows respectively in ink and in pencil the direction of the chief wind and water currents. Insert such names as you know.
4. Find out as much as you can about Columbus, Diaz, Drake, and Magellan. Show by red lines on the map already made for Exercise 3 the routes of their main voyages.

RAINFALL.

Natural vegetation and cultivated crops alike largely depend upon the amount of rainfall received and its distribution throughout the year. A small rainfall which takes place during the growing season of spring and summer is much more productive than a heavy fall in autumn and winter. Rain is received from moving air currents, but all air currents do not yield rain. Rain is received only from air currents that are fully loaded with water-vapour, and from these only when they are forced to rise, and thus to expand and cool, and become unable to hold their former loads of water-vapour.

Most of the moisture in the atmosphere has evaporated from the sea. Winds blowing over the oceans take up full loads of water-vapour, and lands over which they first blow receive the heaviest rainfall. Such lands lie on the eastern sides of continents within the Trade Wind belts, and on the western sides of continents within the Westerly Wind belts. After parting with moisture in the form of rain on the windward sides of continents, the Trade Winds reach the leeward sides as moisture-absorbing winds. Hence the western sides of continents within the Trade Wind belts are dry ; and here are situated the great deserts of the world. Deserts would occur also on the eastern (leeward) sides of continents within the Westerly Wind belts were it not that these areas receive moisture from Cyclonic Rain, in a manner which will be stated presently ; but maritime lands, that is, those situated on the seaward margins of continents, receive in general a heavier rainfall than lands in the interior of land-masses.

The warmer the air, the more water-vapour it can contain, so that winds reaching land after crossing a warm sea carry more moisture than winds which have passed over cool water. Hence summer rainfall tends to be heavier than winter rain.

There are three different ways in which air currents may be forced to rise. Hence there are three different

types of rainfall, although all three frequently occur in combination.

(1) **Convictional Rain** is caused by the heating of that layer of the atmosphere which is in contact with the surface of the earth, with the result that the air is forced to rise, expands, and cools, and the moisture it can no longer hold falls as rain. Convictional Rain occurs in those regions where the land surface is intensely heated, as it is all the year round in the neighbourhood of the Equator, and during summer, when the land is warmer than the sea, within the Trade Wind belts and the Monsoon Region. There is, therefore, heavy rainfall throughout the year in the region of the Equator, the fall being heaviest at the two periods when the sun stands directly overhead in its (apparent) passage northward and southward over the Torrid Zone ; while summer is the rainy season in countries lying within the Trade Wind belts and the Monsoon Region.

(2) **Orographical Rain** is caused by the meeting of a moisture-laden current of air with the obstacle of a mountain barrier. To cross this the air current is compelled to rise, and, in so doing, to expand, to lose heat, and to discharge rain on the windward side of the mountains. After parting with its load of moisture on the windward side, it contracts and heats up in its descent of the leeward slopes, and becomes a warm and moisture-absorbing wind. Hence country on the leeward side of mountains receives scanty rain. Such dry areas are called **Rain Shadows**, and such warming winds are termed Föhn Winds, this being the name given to winds of this type in the Alps. It is the effect of mountain barriers in producing Orographical Rain that causes the areas of highest elevation in any region to contain the districts of heaviest rainfall.

(3) **Cyclonic Rain**. Because the great snow-fields that cover the Arctic lands and Antarctica are so cold, these regions are areas of high atmospheric pressure, from which such bitter winds blow outwards as the blizzard that caused the deaths of Captain Scott and his companions. These cold, dry winds meet the warm, moist Westerly

Winds, here farther north, there farther south, along a shifting battle-front, whose position varies with the ability of the Polar air to force its way equatorwards. The meeting of a cold and a warm air current results in the formation of what is called a cyclone, in which the cold air pushes underneath and lifts up the warm air, so that the warm air is forced to expand and cool, and the moisture it can no longer contain falls as rain. Two great centres for the formation of cyclones are the Aleutian and Icelandic areas of low pressure. Cyclones occur at all seasons of the year, tend to follow each other in "families," and travel in an easterly direction. They bring to district after district in turn, wind, cloud, and rain.

Eastern North America and Central Europe within the Westerly Wind belt receive moisture from Cyclonic Rain. Cyclonic Rain also supplies moisture in winter to lands lying on the western side of continents within Warm Temperate Regions. This type of climate, wherever found, is generally termed "Mediterranean climate," because it is characteristic of the countries round the Mediterranean Sea. Lands on the eastern side of continents within these Regions, because they are the first that are reached by the Trade Winds in summer, receive heavy summer rain.

NATURAL VEGETATION

Rainfall and Temperature together determine (if there is no interference by man) the type of vegetation (or lack of it) of every part of the earth. The higher the temperature, the greater is the amount of moisture that is needed for the growth of plants; and the lower the temperature, the smaller the amount of moisture that is required: but, around the Poles and on the summits of some lofty mountains, a degree of cold is reached which keeps water permanently frozen, and vegetable life becomes impossible.

Wherever there is sufficient rainfall under the local conditions of temperature to maintain throughout the year a supply of moisture in the soil, vegetation is perennial,

that is, plants continue growth from year to year. Such regions are natural areas of forest.

(a) **Evergreen Tropical Forest** occurs in the Equatorial and Tropical Regions. It makes a dense growth composed of many different kinds of trees. Monsoon Forest is a variety, found in the Monsoon Region, in which the trees are leafless during the hot weather.

(b) **Temperate Forest** occurs in the Cool Temperate Regions. In this the trees are either deciduous, that is, they shed their leaves during winter, or coniferous, a type which in most cases is evergreen, and, because its needle-like leaves do not lose moisture too quickly, is more resistant to cold. One kind of tree—oak, beech, pine, etc.—usually predominates in each forest.

On the other hand, wherever, during some part of the year, there is not enough moisture to keep plants alive, vegetation is annual, that is, it starts afresh every year, springing into life from seeds which have been produced during the preceding period of moisture. Such regions are natural areas of grassland.

(c) **Tropical Grassland, or Savanna**, where grasses die down during the dry season of winter, and the scattered trees, which are of a kind able to withstand drought, become dormant, is found within Tropical Regions, and in the Equatorial Region on elevated areas of plateau.

(d) **Temperate Grassland, or Steppe**, is situated in the Cool Temperate Regions. With the increase of heat in summer, instead of with the coming of drought in winter, the grasses wither, forming a crop of natural hay.

(e) **Winter Rain Vegetation.** In those lands of the Warm Temperate Region that receive winter rain, there is enough moisture for tree growth, but, because the winters are mild, trees typical of these areas do not shed their leaves before winter, but retain them, to take in moisture. On the other hand, the summers are hot and dry, so that the leaves of, for example, the "evergreen oak" and the olive are small, to avoid loss of moisture by evaporation, while other plants, like the vine, have elaborate root

systems, to draw moisture from the deeper layers of the soil.

(f) **Tundra.** Similar precautions to avoid excessive loss of water are characteristic of the low-growing shrubs of the Tundra, lying between the belt of coniferous forest and the cold desert round the North Pole. Here the cause of their small leaves is not the absence of water, but the inability of the roots of the plants to absorb it, because of the coldness of the soil.

The alteration from one type of vegetation to another, as always happens in Nature, is gradual, forest usually merging into grassland, and grassland into desert, where there is not enough moisture to sustain plant life. The slopes of a lofty mountain range, as well as the different degrees of latitude, stretching polewards, show the successive changes from forest through grassland to cold desert.

CLIMATE AND MAN

If different types of vegetation are suited to different conditions of climate, is it not probable that there is some type of climate in which man, too, will be most active and best able to work? A climate that is bitterly cold seems not to encourage human energy, but to numb it. In a climate that is constantly hot one can only be comfortable by exerting oneself as little as possible. So far as regards white people, it seems probable that conditions are most favourable when the summer temperature out of doors, taking day and night together, averages not much above 65 degrees Fahrenheit, and winter temperature not much below 40 degrees Fahrenheit. Frequent changes in temperature, such as stormy weather brings, give a much greater feeling of activity than a temperature that hardly varies from day to day. There should also be rain at all seasons, so that the air is kept moderately moist. These conditions are provided by cyclonic storms (p. 25) in southern Canada and most of the United States, in west and central Europe, in New Zealand and southern Australia, and also in Japan.

It is probable that the same general climatic conditions—a marked contrast between seasons, but without great extremes of heat or cold, dryness or moisture, and frequent moderate changes due to cyclonic storms—are those which are also most favourable to the health and activity of peoples of the black, yellow, and brown races. The easy-going habits of such peoples in warm countries are probably forced upon them by the climate; and white men, who live in such countries, generally find it necessary to adopt their ways. Tropical climates are also favourable to the spread of insect-carried diseases, such as malaria, which make persons infected less able for work.

SUMMARY OF CHAPTER

(1) Man must satisfy his needs either from the resources of his own neighbourhood, or by means of Commerce, which implies a difference in products between buyer and seller.

(2) Commerce deals with the products of the Five Harvests.

(3) The fact that all districts do not share equally in the Five Harvests is chiefly due to climate.

(4) Temperature Zones and Wind Belts combined give six different types of Climatic Regions—(1) Polar, (2) Cool Temperate, (3) Warm Temperate, (4) Tropical, (5) Equatorial, (6) Monsoon.

(5) Temperature and Rainfall produce six different types of Natural Vegetation.

(6) Climatic conditions are not everywhere equally favourable to the activity of man.

EXERCISES III

A

1. How does the atmosphere receive moisture? What causes it to give up this moisture? Give the names of the different kinds of rainfall, and indicate how each type is produced.
2. What are the differences between (a) Temperate and Tropical Forests, (b) Savanna and Temperate Grassland? (c) Give a prominent example of each.

3. Why do small-leaved trees or shrubs grow both in Arctic lands and round the Mediterranean Sea ?
4. Name the six Natural Vegetation types, and give a prominent example (country or district) of each.

B

1. What type of climate is best suited to man's health and activity ? Why ? Name three countries which enjoy such a climate.
2. On a map of the world show by shading (*a*) the wettest, (*b*) the driest regions. Account for their being so.
3. Account for the heavy rainfall in the following regions : Amazon basin (January), Coast of Chile (July), Gulf of Mexico, East Indies, Coast of British Columbia (January), East of Madagascar (July).
4. In what respects does the Warm Temperate Region differ from the Cool Temperate ? Illustrate your answer by reference to North and South America.

CHAPTER II

THE WORLD'S HARVESTS

MAN'S FOOD

MAN's food must contain a variety of elements. Milk contains all these elements, and most foods contain more than one of them. They may be classified thus :

- (1) **Flesh-forming protein** for **growth**. This is obtained from meat, cheese, peas, and beans. The cereals also contain protein.
- (2) **Sugar and starch**, known as **carbohydrates**, supply **energy**. These are obtained from cereals (wheat, rice, etc.), potatoes, and fruits.
- (3) **Fat** for providing **heat**. This is given by meat fats, by butter, and by vegetable oils yielded, for example, by nuts and olives.
- (4) **Mineral salts** for **forming bone** and **cleaning the blood**. Such salts form part of fruits and vegetables.
- (5) **Vitamins**, which help the other elements to do their work, are present in fresh green vegetables, fruits, egg-yolk, milk, and other fresh foods, and in cod-liver oil.
- (6) **Water** is necessary that these foods should enter into the blood : it may be taken in its natural state, or in the form of tea, coffee, cocoa, wines, and other beverages.

A mixed diet is at all times necessary, but some articles of food are naturally more important than others, and so appear more regularly in diet. Foods that contain both protein and carbohydrates are nearly perfect foods. Such foods are the **cereals**, or grains.

VEGETABLE FOODS : ENERGY FOODS (CEREALS)

The cereals are all grasses, which have been developed from wild plants. The settled life of the cultivator began when it was discovered that the seed of certain grasses, thrown on upturned ground, would yield a crop of grain, which formed an almost perfect food. Probably as early as 5000 B.C. wheat and barley were first cultivated either in south-west Asia or in the valley of the Nile. Since then further increase of yield has been effected both in the size of the grains and in the number produced by a single plant, and species have been produced specially able to withstand drought and frost.

(a) **Wheat.** Wheat is a popular food, for the reason that wheat bread is lighter than bread made from any other cereal. Wheat, being a grass, has two stages in its growth. There is first the vegetative growth which produces the straw, and second the development of the grain, that is, the seeds. The number of stalks of straw that a single seed yields, each to bear its head of grain, depends upon the duration of cool, moist weather during the first stage ; but vegetative growth must then be checked by a marked rise of temperature and decrease in moisture to ripen and harden the grain. The climate best suited to wheat is thus that of western lands in Warm Temperate Regions, such as North Africa, which have mild, rainy winters and hot, dry summers. In climates of this type, wheat is sown in autumn, and is known as "winter wheat." In countries where the ground is broken up in winter by severe frosts, but where spring is moist and mild and summer hot and dry, as in Canada, "spring wheat" can be sown in spring and harvested at the end of summer. Wheat can therefore be grown in both the Warm and the Cool Temperate Regions. It is unsuited to the continuous moisture of Tropical Regions.

Wheat quickly exhausts the soil by using up its mineral plant-foods. In lands where it has long been cultivated, it is necessary to return these plant-foods to the ground in the

form of manures, and also by growing other crops in rotation with wheat. In such lands a considerable amount of human labour is required for every acre cultivated. In the great plains of the Cool Temperate Regions, however, there are millions of acres where the soil has not been exhausted by cultivation. The growing season in these plains is short, because they are situated in the interior of continents and therefore have a drier climate than that of maritime lands. But their surfaces are level and unbroken by trees, so that human labour can be replaced by agricultural machinery on a large scale, and the work of ploughing, sowing, and harvesting can rapidly be carried through. Over their level surfaces, also, railways can easily be built to carry the crops to the seaports. Wheat is harvested in some part of the globe all the year round, but these two factors of cheap production on a large scale and cheap transport have

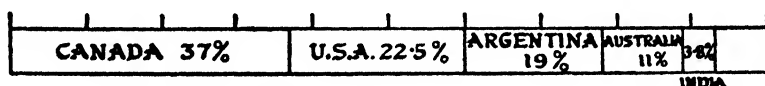


FIG. 7.—World's Net Wheat Export (after deduction of imports).

made the great plains of Cool Temperate Regions the main exporters of the wheat that is baked as bread for the city populations of industrial regions.

THE WORLD'S WHEAT CROP

Country.	Production, 1931. (In Millions of Quarters.)	Months of Harvest.
Soviet Union .	probably 120	July–Sept.–Oct.
United States .	111	June–July.
India . . .	43	Feb.–March.
Canada . . .	38	July–August.
France . . .	34	June–July.
Italy . . .	31	June.
Argentina . .	28	January.
Australia and New Zealand	24	December–January.
World . . .	549	All the year round.

(b) **Rice.** The conditions under which rice is cultivated are very different from those necessary for wheat. Temperature must average about 70 degrees F. during the six months of growth. Further, the seeds are sown in mud or under water, and the plants grow in a few inches of water until near harvest. Thus a high summer temperature, a heavy rainfall (or, as an alternative, water supplied by irrigation), and low-lying land, such as river deltas and coastal plains, are all necessary for the cultivation of rice. Rice is the great cereal crop of regions with wet summers, that is, of the Torrid Zone and of those eastern lands of Warm Temperate Regions that have heavy summer rainfall.

The crop yielded by an acre of rice is estimated at twice that of an acre of wheat, and two or three crops can be taken from the same field in the course of a year. Thus one or two acres support a cultivator and his family, and rice-growing areas usually contain very dense populations. Rice was

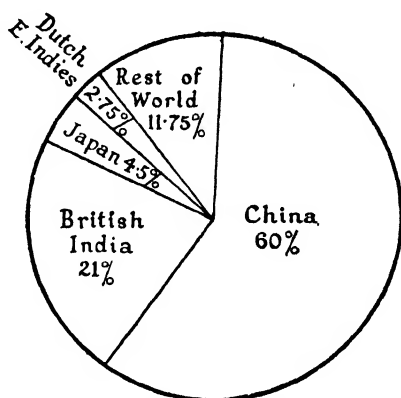


FIG. 8.—World's Rice Production.

probably first cultivated in the Monsoon Region of eastern Asia. There, and in the equatorial islands of the East Indies, vast populations depend upon it as their chief food, those lands, such as Burma and Indo-China, which are less densely populated, exporting their surplus to countries, such as Japan, which cannot grow all the rice they need. Thus rice makes possible the cheap labour of Indian, Chinese, and Japanese coolies, who live on a vegetarian diet.

(c) **Maize.** Maize, or Corn, as it is called in the United States, was the only important cereal cultivated by the American Indians before the discovery of the New World by Europeans. It is grown in lands with long, hot summers

and frequent summer rains, not in countries of Winter Rain climate ; and the fact that it cannot endure any frost prevents its cultivation as far poleward as wheat. With these exceptions it can be grown over large areas of the Warm Temperate, Cool Temperate, and Tropical Regions. About two-thirds of the world's crop is raised in the upper Mississippi valley in the United States.

Maize can be sown in ground that is too rough and stony for wheat ; also, an acre under maize yields about twice as large a harvest as an acre under wheat. The world production of maize is greater than that of wheat. Yet the export trade in this grain is much smaller than the export of wheat, because maize does not make good bread, although in other forms, such as cornflour, it is used for human food. Its great value is for fattening animals, as it contains more oil than any other cereal. It enters into world Commerce mainly in the form of horses and mules and of beef, pork, and mutton.

(d) **Oats.** Oats require a cooler temperature and more moisture than wheat, and hence are grown nearer the Poles. They contain a larger proportion of protein than any other cereal, yet only in Scotland has their great value for human food been appreciated. Elsewhere they are used mainly to feed horses and cattle.

(e) **Rye.** Rye is grown within much the same latitudes as oats, except that oats are better suited to a moist maritime climate while rye can endure the harsher "continental" climate met with in the interior of great masses of land. It flourishes on soils that are too poor in plant-food to nourish any other cereals, and ranks next to wheat in importance as a bread-plant of white peoples, being made into the "black bread" of countries in the European Plain.

(f) **Millets.** Millets include several cereals, which, because of their resistance to drought, are grown to supply the starch element in human food in the drier areas of tropical Asia and Africa, where the annual rainfall is insufficient for rice.

(g) **Barley.** Barley is the most adaptable of all

cereals. It will ripen within the Arctic Circle in a climate that is too cold for wheat, and near the Equator in Africa, where the summer rains are too scanty for maize. It was probably the chief cereal of the ancient Hebrews, Greeks, and Romans ; but, because it does not make good, light bread, is cultivated to-day mainly as a forage crop for animals, or for the manufacture of **beer** and **whisky**, which are beverages of cool climates.

THE WORLD'S CEREAL PRODUCTION, 1931

Country.	(In Millions of Quarters)			
	Maize.	Oats.	Rye.	Barley.
World . .	480	421	183	177
Argentina . .	44	7	..	..
Canada . .	..	35	..	8
Germany . .	..	43	31	17
Poland . .	..	16	26	8
Roumania . .	28	5	2	8
Soviet Union . .	20	110	100	35
U.S.A. . .	298	111	4	24

VEGETABLE FOODS : OTHER ENERGY FOODS

(a) **The Potato.** Among starch-giving plants which enter into diet because of their high value in energy food, the most important is the **potato**, a native of the dry, lofty plateaus of the Andes, whence it was introduced into Europe after the Spanish conquest of Peru. To-day it is grown within limits as wide as the margin of the Torrid Zone in Egypt and Florida and the poleward edge of the Cool Temperate Region in Alaska. The potato yields six times as many bushels per acre as wheat, but its cultivation requires more labour than that of any grain. Hence it is best suited for countries where labour is cheap, either because of dense population or because of a low standard of comfort. Three-fifths of the world's crop comes from central and eastern Europe, that is, from the Soviet Union,

Germany, and Poland. Town populations are necessarily supplied by neighbouring agricultural areas, for the potato is unsuited to long distance transport.

(b) **The Banana.** Another valuable starch food is the banana, which is found all round the world in the belt of Tropical Forest. In tropical lands remote from the markets of Europe and North America it grows almost without cultivation, and feeds the native populations at the expense of little labour. Temperate markets are supplied, from the countries and islands of the Caribbean Sea, and from the Madeira, Canary, and Cape Verde Islands off the west coast of Africa, with fruit cultivated on plantations and transported in swift, specially-ventilated vessels.

Another tropical starch food is **manioc**, or cassava, from which we obtain tapioca.

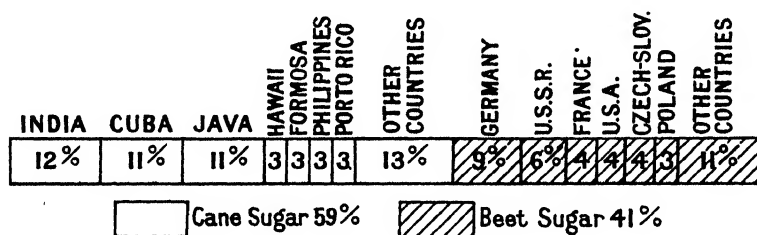


FIG. 9.—World's Production of Sugar.

(c) **Sugar.** Sugar as well as starch is an energy food. Sugar is present in the sap of nearly all plants, but the most perfect producer of sugar (except the bee) is the **sugar cane**. This is a plant of the Torrid Zone, as it needs a wet season with much sunshine for vegetative growth, followed by a dry and cooler season to encourage the formation of sugar in the stem. It is, therefore, best suited to warm climates with summer rain.

During the Napoleonic Wars continental Europe was cut off from its ordinary sources of sugar supply in tropical countries, and successful attempts were made to increase the yield of sugar from beet. This change, with subsequent developments, has led to beet sugar supplying to-day over two-fifths of the world market (Fig. 9). The **sugar beet** is

a plant of Cool Temperate Regions, by far the greater part of the world's beet sugar being produced in a belt across the European plain from France to the Ukraine, with an important detached area of production in Czechoslovakia. Some sugar beet is cultivated in Great Britain. The two chief sugar-importing countries are the United States and Great Britain. One-fifth of the world's sugar is grown in the British Empire. India, however, consumes the whole of its own crop, so that, although Mauritius and the British West Indies supply a small percentage of the raw sugar imported by Great Britain, most of this import comes from Cuba.

VEGETABLE FOODS : PROTEIN AND FAT.

Protein and fat in diet are generally obtained from animal foods ; but in countries where little animal food is available they are supplied by vegetables. **Peas** and **beans**, which are rich in protein, are usual crops in rice-growing areas, because rice contains only a small amount of protein. Similarly, where millet is the main food-crop, **pulses**, such as gram (or chick-pea), soya beans, and ground-nuts (pea-nuts, or monkey-nuts), are also cultivated to give protein and fat. **Nuts**, such as almonds, walnuts, and Brazil nuts, contain both these elements of diet. In the countries round the Mediterranean Sea, the oil of the **olive**, a fruit of Winter Rain climate, is used as a substitute for butter and animal fat, because there are no large grazing areas for cattle. Another substitute for butter is **margarine**, manufactured from oils from the fruit of the **oil palm** of west tropical Africa, and from the nut of the **coco-nut palm** of east tropical Africa, India, and the islands of the South Pacific Ocean. The dried kernel of the coco-nut is known commercially as copra.

VEGETABLE FOODS : DRINKS

(a) **Tea.** In hot and densely populated countries water is apt to contain disease-carrying germs, and must be boiled before it is fit for drinking. Many centuries ago

the Chinese learned how to render this boiled water attractive by using it to make tea ; during the eighteenth century tea-drinking became popular in Europe. The tea plant is a native of the Monsoon Region. For successful cultivation it requires high temperature, a long growing season, heavy rainfall, and an abundant supply of cheap labour, all of which this Region, with its dense populations living on a vegetarian diet, is able to provide. As its roots cannot develop where the soil contains stagnant water, tea gardens are generally situated upon hillsides. More than half the world's tea crop is raised in China and Japan, but these countries consume most of their own production. The chief exporting countries are India, Ceylon, and the Dutch East Indies, where tea is grown on large plantations by native workers under the supervision of European managers. Other " luxury " foods, such as sugar, coffee, and bananas, and raw materials for manufacture, such as cotton and rubber, are also produced on such tropical plantations.

(b) **Coffee.** The coffee plant is suited to the margins of the Tropics. It needs a warm, moist climate, a moderate rainfall, and rich, well-drained soil. Unlike tea, it cannot endure frost. The world's production of coffee is more than twice that of tea, two-thirds coming from Brazil, and smaller quantities from the highlands of the Andes, the Dutch East Indies, and Central America.

(c) **Cocoa.** Another plant which helps us to enjoy our meals is cacao, from the beans of which are manufactured cocoa and chocolate. The cacao tree needs much heat and moisture, and shelter from winds which would knock down the melon-shaped pods. It is a plant of equatorial lowlands, though it grows also in sheltered districts within the Trade Wind belt. More than half the world's cacao comes from British West Africa, lesser quantities from Brazil and the Caribbean region.

(d) **Wine.** The vine probably originally grew as a wild plant in southern Europe and south-west Asia, where there is a Winter Rain climate. Wine prepared from its grapes supplied drink during the rainless summer, and the grapes,

dried as raisins, were a food. The vine has been introduced into the Winter Rain lands of the other continents. The finest wines, however, come from districts of France and Germany, where a winter colder than that of Winter Rain climates brings to perfection the quality of the wine.

(e) **Cool Climate Drinks.** We have already (p. 35) noted the manufacture of **beer** and **whisky** from barley. In apple-growing districts **cider** is the popular drink.

VEGETABLE FOODS : FRUIT AND VEGETABLES

The chief fruits of Commerce are those which, like citrus fruits, have tough skins so that they can stand handling, or can be packed unripe, like bananas. Some, grown in countries with hot, dry summers, are sun-dried ; while others are kept fresh by canning. Vegetables, especially green vegetables, will not keep fresh during transport over great distances, and are generally grown near the market for which they are intended. The only tropical fruit that enters largely into world Commerce is the banana. Within the belt of the Trade Winds the **date palm** is the fruit tree of the margins of the deserts, and of oases in the deserts, of northern Africa, Arabia, and Persia. More than half the date palms in the world are in the countries that border the Persian Gulf.

Citrus fruits belong to summer rain regions. The orange, lemon, and lime are natives of the Monsoon Region, and the grape-fruit of the Malay Peninsula. Where they are cultivated in Winter Rain lands, as is done extensively round the Mediterranean Sea and in California, they must be given water by means of irrigation during the dry summer. **Pumpkins, melons,** and other varieties of **gourd**, are important in countries with hot, dry summers, both as human and as animal food. We have already noted (pp. 37-8) the value of the **vine** and the **olive** in lands with Winter Rain climates. Another characteristic fruit of such lands is the **fig**.

On the poleward side of Winter Rain areas the type of

fruit grown changes to varieties that require more moisture and less heat, such as **plums, pears, cherries, and apples**. The most important is the apple, which is adapted to a wide range of climatic conditions. It can be grown as far north as 65 degrees, but the best fruit is produced in hot summer climates, such as those of Canada and the United States. In the same climates as these fruits are grown green vegetables of the **cabbage** family, and roots, such as **turnips**, which supply winter feed for farm stock. Still farther poleward are found the various forms of **berries**, wild as well as cultivated, which become the characteristic fruit in the Tundra.

SPICES AND DRUGS

Farmers in the Middle Ages had no knowledge of the use of roots to give winter feeding for stock. Cattle were killed about November, while still in good condition, and the meat salted ; and spices, such as **pepper** and **ginger**, were much in demand to make palatable this salted meat. The most important spices are products of the Torrid Zone. They came to mediæval Europe from Eastern Asia ; and it was to obtain touch by new routes with the spice trade of Eastern Asia that Vasco da Gama rounded Africa, and Columbus crossed the Atlantic, after the old routes by Baghdad and Alexandria had been closed by the Turks.

Certain plants are used in the manufacture of **medicines**, such as the bark of the tropical cinchona tree, from which is made **quinine**. The hardened juice of the **opium** poppy is smoked in China because of its soothing effect. From it **morphia** is prepared. **Tobacco**, like opium, soothes and stimulates. The tobacco plant is a native of tropical America, whence its cultivation has spread to all regions of the world except the hot and cold deserts. The United States produces more than one-third of the world output, while India supplies three-tenths.

EXERCISES I

A

1. Name one typical cereal of each of the Tropical, Monsoon, Warm Temperate, and Cool Temperate climates, and explain the requirements of each plant.
2. (a) Why are the United States and Canada both large exporters of wheat ?
(b) Why does Canada export more wheat than the United States ?
3. Why is the daily wage of a Chinese or an Indian coolie much smaller than that of a farm worker in Great Britain ?

B

1. Mention fruits which you would expect to find growing in Greece, Southern China, New Zealand, the Sahara Desert, Lapland, Jamaica.
2. Make a list of the vegetable foods produced in large quantities (a) in Argentina ; (b) in the Caribbean area ; (c) in the countries round the Mediterranean Sea ; stating the reason in each case.
3. Distinguish between the types of climate which favour production of grapes, cacao, coffee, and tea.
4. Why are potatoes an important crop in Ireland and the Scottish Highlands ?

FOOD SUPPLY : ANIMAL FOODS

About 9000 or 10,000 years ago tribesmen, living on the southern edge of the great Temperate Grassland that stretches across Asia into Europe, learned how to tame cattle and other wild animals, and changed from hunters into herdsmen. The domestication of animals not only gave man a greater and more certain supply of food than he could obtain from the chase, but also, by his use of animals for draught purposes, made it possible to cultivate with the plough larger areas than could be tilled with the hoe, and made it easier to convey people and goods from place to place.

Out of every £3 worth of food consumed in the world to-day, roughly about £2 value represents vegetable foods, 9s. 9d. value represents meat of all kinds, 1s. 9d. eggs, and 8s. 6d. milk. Meat, broadly speaking, supplies protein and fat to human diet, while vegetables supply starch. But

many peoples obtain a complete diet from vegetable foods. Cattle, in fact, and in less degree pigs, compete with man for food ; because the production of a pound of meat requires either the grass from much land or sufficient grain to make eight to fifteen 1-lb. loaves of bread. In densely populated countries, such as India, where there is not enough land to grow food for both men and beasts, man has usually to content himself with a vegetable diet. It is, in general, countries, like Australia, with small populations and much land, whose inhabitants can afford to eat large quantities of meat.

In certain countries, however, a large consumption of meat has been made possible by the means of Commerce. The annual consumption of beef and mutton in Great Britain and Ireland is roughly 100 lb. for every man, woman, and child of the population, although only a little more than half this quantity is produced at home. The extent to which meat forms part of the average diet in Great Britain is a condition which has come about within the last sixty years. It has been made possible by the invention of methods of freezing and chilling meat, of cold storage on land and in the holds of meat-carrying vessels, and of hermetically sealing meat in tins to keep it eatable for a long period. These inventions have led to increased meat consumption, not only in Great Britain, but generally amongst all communities of European descent.

EXPORTS OF FROZEN AND CHILLED BEEF AND MUTTON, 1930

(In Million £)		
Argentina . . 27½	Australia . . . 5	Brazil 4
New Zealand . 11	Uruguay . . . 4	

(a) **Cattle.** Domesticated cattle and sheep are both descended from wild species which lived in wide open spaces

—cattle on plains, sheep on mountains and plateaus. Their natural food is the grasses which spring up afresh every year in such regions. The conditions most favourable for the European species of domesticated cattle, which yields more milk than other species, are fairly cool, moist summers, rain at all seasons, and so little cold weather in winter that grass is green throughout the year. Cool summers favour the raising of cattle for dairy purposes; warmer summers are more suitable for beef cattle. Since the processes of refrigeration made it possible to ship beef overseas from the great plains of the New World and Australia, the older countries of Europe have more and more come to take their beef from these regions, and have rather looked to their own cattle industries to supply them with dairy products, especially with milk, which will not keep fresh during long-distance transport, but which, with the exception of rice, is probably the most valuable single product in the world. Even these dairy cattle, however, depend for winter feed largely upon maize, oilcake, soya beans, and other imported vegetable products; and considerable quantities of butter and cheese are also brought to industrial areas in Europe, either from cattle districts in other continents or from European countries that specialise in dairying, such as Denmark and Holland.

In the Monsoon Region of Asia and in tropical Africa other species of cattle are raised, either for draught purposes or for use instead of money as a medium of exchange. Important by-products of the cattle industry are hides, horns, and tallow.

EXPORTS OF BUTTER AND CHEESE, 1930

(In Million £)		
New Zealand . . 18½	Australia . . . 8½	Argentina . . 2½
Denmark . . . 17	Irish Free State 3½	
Holland . . . 11	Canada . . . 2½	

(b) **Sheep.** As cattle are generally bred either for beef, milk, or draught, so sheep are raised either for wool or for mutton. Because of its fleece, the sheep is not suited to the moist heat of tropical climates. Where sheep occur "within the Tropics," they do so in mountainous countries, where elevation above sea-level brings a relatively cool temperature. Outside the Tropics, a dry, fairly warm climate is favourable for the production of a good fleece, while a damp, cool climate is more suitable to sheep bred for mutton.

Sheep are better adapted than cattle to rugged regions, and can thrive on grass so short that other animals cannot bite it off. They are more helpless than cattle against attack by wild beasts; but it does not pay to employ shepherds to watch them unless large flocks of sheep can be kept. This is only possible in districts where there are few inhabitants. On the other hand, they yield in their fleece an annual crop which is not perishable, and can easily be transported. All these factors result in making sheep-raising an industry of areas that lie on the margins of human settlement, either because they are too dry for agriculture, as in certain parts of Australia, or too mountainous, as in the Scottish Highlands, or else because, as in New Zealand, there is not yet sufficient population to create a demand for the products of other types of farming. In regions that are specially rugged, or have a vegetation of shrubs rather than of grass, sheep are replaced by goats. A nanny-goat gives about one-fifth as much milk as a cow.

SOME GREAT SHEEP COUNTRIES

Number of Sheep in Millions.		
Australia. . 106	South Africa . 48	New Zealand . 31
Soviet Union . 90	Argentina . 44	
U.S.A. . . 53		

(c) **Pigs.** Unlike cattle and sheep, pigs are naturally inhabitants of forests, not of open plains or mountains. They have small stomachs, and require food in a concentrated form, such as forest products like acorns, grain, and potatoes, though they will refuse practically nothing that is edible. Of all animals, they convert their rations most efficiently into meat. Pigs thus furnish the most suitable source of meat for the man with a very small farm, and for countries that are densely inhabited, such as China ; while pig-raising on a large scale becomes profitable in regions where maize, barley, or potatoes are cheap and plentiful, as in the Corn Belt of the United States. As pigs thrive on buttermilk and whey, dairying countries, such as Denmark and Ireland, are large producers of bacon. From Mohammedan lands pigs are excluded, because for religious reasons they are regarded as unclean.

(d) **Poultry.** Poultry, like pigs, thrive on food that people discard, and turn their rations very efficiently into flesh and eggs. Poultry-keeping is probably the most widely distributed form of animal industry ; and the world's annual production of eggs is equal in value to that of oats or mutton.

(e) **Fish.** The mingling of warm and cold currents in shallow water is believed to favour the production of large quantities of minute sea animals, which feed on floating sea plants. Fishes feed upon these and upon the materials carried into the ocean by rivers. Cold currents occur only in Cool Temperate Regions. Temperate seas, therefore, contain many more fish than tropical waters ; and in temperate seas great numbers of individuals of the same species are found together. Fish from cool waters are more palatable, and keep fresh longer than those taken in warm seas. The great fishing grounds of the world are thus in northern waters, being either submarine " banks " or areas of the land masses of the continents which are covered by water only to a depth of 100 fathoms (600 feet). Such an area is termed the "**continental shelf.**" The three greatest fishing regions are the continental shelf of

north-west Europe, north-east North America, and north-east Asia.

Sea fish are of two main kinds : (*a*) Demersal (or "bottom fish"), which live at, or near, the sea-floor, and are caught by the trawl, such as haddock, cod, plaice, and halibut ; and (*b*) Pelagic (or "surface fish"), which live near the surface, the most important including the herring, mackerel, and pilchard, caught in drift nets. The chief source of the world's supply of salmon is the rivers of the north Pacific, which these sea fish enter annually to spawn. Salmon-canning is an important industry on the Pacific coasts of the United States and Canada.

EXERCISES II

A

1. Consider your own meals ; classify the different foods as vegetable and animal. Name the most important regions of their production.
2. Collect advertisements, tin and packet labels of fruits and other foods. Whence do these foods come ?

B

1. Are vegetable foods or animal foods the more important ? Is it possible to do without either one or other ? Give reasons for your answer.
2. Compare cattle and sheep as regards (*a*) their origin ; (*b*) their capacity to produce human food ; (*c*) main sources of meat supply.
3. Explain why pigs are not numerous in Turkey, sheep in the Congo region, cod in the Mediterranean Sea.

TEXTILE RAW MATERIALS

From man's need of clothing the textile industries have come into existence. Fibres of all sorts, when twisted round each other, cling together and form a rope or thread. Such threads are woven together to make cloth, all kinds of which are referred to as textiles. Modern textile industries are in part a result of the Industrial Revolution, which began in Great Britain in the eighteenth century.

A series of inventions of new machinery changed the textile industries from manufactures that were carried on in the homes of the workers into businesses conducted in great factories, that housed machinery driven first by water, and later by steam power. But these industries are also due to the immense growth of modern Commerce ; for in many cases raw materials have to be brought thousands of miles to the factories, and cloths have to be taken similar distances to the places where they are used.

(a) **Wool.** Woollen clothing is suitable for cold climates, because it prevents the escape of the heat of the body, allows the moisture of perspiration to pass through, and does not easily become soaked with rain. The value of the wool of all the world's sheep is about twice as great as that of their mutton. In the course of manufacture the fleece is washed and combed or carded to straighten the fibres. Short-fibred wools are then in general spun into woollen yarns, long-fibred wools into worsted yarns. The fibres may also be beaten and rolled into felt. The leading wool-exporting countries are Australia, Argentina, South Africa, and New Zealand. Wool or hair is obtained from the alpaca, the camel, and the goat as well as from the sheep.

(b) **Cotton.** A greater proportion of mankind lives in mild and warm than in cold climates, and prefers cotton to woollen clothing. In addition, cotton is produced more cheaply than wool, and does not require such expensive treatment before manufacture. Thus the world production of cotton is more than four times as great as that of wool. Raw cotton is the most valuable agricultural product handled by world Commerce, and cotton textiles are the most valuable of manufactured articles.

Cotton is obtained from fibres attached to the seeds of the cotton plant, and contained in a pod, or boll. It can be grown almost everywhere between 40° N. and 30° S., its poleward limit being decided by the necessity for seven months free from frost. Bright sunshine is essential, also warmth, and a moderate amount of moisture. In regions,

such as Egypt and the Sudan, where summer rain is scanty, moisture can be supplied by irrigation. Different species of the cotton plant yield varying lengths and strengths of fibre, or staple, the longer and stronger staples making the best thread. After the invention in 1793 of the cotton "gin," which separates the seeds from the fibre by machinery instead of by hand labour, cotton fabrics became cheaper to produce than woollen and linen goods, and replaced them for many purposes. For more than a hundred years, at least half the world's annual cotton crop has come from the Cotton Belt in the United States, with India and Egypt as secondary areas of production. Cotton is also grown in the Sudan, Uganda, Brazil, and elsewhere. There is a great variety of cotton fabrics, the raw material being used in the making of calico, canvas, flannelette, muslin, and many other goods.

(c) **Plant Stem Fibres : Linen, Jute, Hemp.** A group of fibres is obtained from the stems of certain plants. The most important is lint, which is derived from the stem of flax, a plant of Temperate Regions. **Linen** is manufactured from lint, while flax seed yields **linseed oil**, and is made into **oil-cake**, a cattle food. The production of flax is only one-sixth as great as that of cotton. **Jute** is obtained from a tropical plant, practically the whole supply coming from the Ganges valley. It is employed mainly in the making of sacking, such as is used to contain agricultural produce. **Hemp**, from which are manufactured ropes and other strong fabrics, is a Warm Temperate crop. A tropical hemp—Manilla hemp—is grown in the Philippines; another variety—sisal—in the Caribbean region and East Africa. **Coir**, the matting on the outside of the coco-nut, is used to make brushes and door-mats.

(d) **Silk.** Silk is a fibre of animal origin, obtained from the silkworm. Silkworm culture is successful only where the mulberry tree grows two crops of the leaves on which the insect feeds—that is, in areas between 40° and 15° on either side of the Equator having considerable summer rain, or where moisture is given by irrigation. As the care of the

silkworms requires regular, cheap, and careful labour, production of silk takes place chiefly in China and Japan in the Monsoon Region, and in Italy—a Winter Rain land—by means of irrigation. The United States and France are the leading silk-manufacturing countries. The United States, because of its abundant supply of raw material, is also the principal manufacturer of “**artificial silk**” (rayon) out of cellulose obtained from cotton or wood-pulp, and drawn into thread such as the silkworm spins into its cocoon.

FOREST PRODUCTS

The chief timbers dealt with by Commerce are soft-woods from the coniferous Temperate Forests—various kinds of fir and pine, used for **fuel**, **building**, **pit-props**, and the manufacture of **wood-pulp** for **paper** and **artificial silk**. The sap of certain pine trees yields **turpentine** and **resin**. Tropical and Monsoon Forests supply hardwoods, such as mahogany, ebony, teak, green-heart, rosewood, and quebracho, which are suitable for the construction of **furniture**, **houses**, **ships**, and for other purposes. The evergreen oak, from the bark of which **cork** is manufactured, is a native of the Winter Rain lands of southern Europe ; while the wattle tree, a source of **tannin** which turns raw hide into leather, also grows in a dry climate. The spread of settlement throughout Europe and, later, North America led to reckless use, and even more reckless waste, of the timber resources of these continents. In three centuries the area covered by virgin forest in the United States has been reduced from 820,000,000 acres to about 138,000,000. Alike in America and in Europe new forests are being planted to make good in part the wasted bounty of Nature. This decrease in the world's Temperate Forests has in part caused a scarcity of **furs**, which are taken from wild animals of these forests. As in the case of timber, attempts are being made to make good this shortage by breeding Arctic foxes on fox farms.

Rubber is manufactured from the coagulated sap, or latex, of trees of several species, a strip of bark being cut off, and the sap allowed to drain into a cup. At first it was used only as an eraser ; then a Scottish chemist, Charles Macintosh, invented waterproof cloth ; later rubber came into greatly extended use for tyres and other purposes. Rubber-yielding trees grow only in regions where there is an annual temperature of 70 degrees F. and an annual rainfall of 80 inches. For many years the main sources of supply were the tropical forests of the Amazon and Congo basins. In 1876, however, seeds of the Brazilian rubber tree were successfully germinated at Kew Gardens near London ; and from seedlings sent from Kew to Ceylon, Singapore, and Java the cultivation of rubber began on plantations. " Plantation " rubber from Malaya, the Dutch East Indies, and Ceylon now supplies over 90 per cent. of the world market.

EXERCISES III

A

1. Compare Cotton with Woollen fabrics as clothing for (a) Summer, (b) Winter, in your own locality.
2. Give an account of the kind of clothing required by man in each of the five great regions of the World (Chapter I).
3. Make a list of the uses made of the timber of coniferous trees.

B

1. Mention two raw materials of the textile industries of which main sources of supply are situated (a) in the Monsoon Regions ; (b) in Cool Temperate Regions. Give reasons in each case.
2. Make out a table in three columns. In the first write the names of trees, in the second where chiefly they are grown, in the third the principal use to which they are put.
3. Give any instances you can of discoveries and inventions which (a) have increased the yield of the Earth's Harvests ; (b) have altered the source of supply of any article.
4. Compare the importance of (a) Tropical, (b) Temperate Regions as sources of supply of foods and raw materials for manufacture to industrial areas in Europe and North America.

THE HARVEST OF THE ROCKS: SOILS

Rocks are of two main kinds :

- (1) **Igneous rocks** originally existed in a fluid, or molten state, and became solid either at great depths below the surface of the earth, or after they were poured out as lava upon the surface by volcanoes.
- (2) **Sedimentary rocks** are composed of fragments of igneous rocks, that were broken up by the action of air and water, laid down afresh by the same agencies on the beds of seas and lakes, and raised up at a later period as dry land. Of these there are four chief groups—**Sandstones, clays, limestones, and coals**, which differ in the size of their grains and in the chemicals they contain.

From these rocks, when they are broken into minute grains by weathering, different soils are formed. Soils are valued for agriculture largely according to their ability to supply the various chemicals which nourish vegetation. The grains of which they are composed have in most cases been carried a greater or less distance—sometimes thousands of miles—from the rocks out of which they were weathered, and laid down afresh by rivers (alluvial soil), glaciers (glacial soil), or winds (loess). The most fertile soils are as a rule those formed from lava, or alluvial soils that occur where the slope of the land is very gradual ; because it is only the finest grains that a river is still carrying by the time it reaches such a stage in its course ; and because, also, these grains are a mixture from all the different varieties of rock over which the stream has travelled, and hence probably contain all the chemicals necessary for plant-food.

THE HARVEST OF THE ROCKS : SALTS AND FERTILISERS

The fertility of soils can be increased by supplying one or more of the three principal chemicals that are necessary

to the growth of plants—phosphorus, potash, and nitrogen. **Phosphorus** is chiefly obtained from the fossil remains of animal life, which occur as mineral deposits of the salts called phosphates. Nearly half the world's output is mined in French North Africa, three-tenths in the United States. Another source of phosphorus is basic slag, which is a by-product of the manufacture of steel. **Potash** can be obtained from various sources, such as wood ashes, but virtually the whole supply comes from deposits of salts in Germany and France. The known mineral resources of the world contain enough of both these fertilisers to satisfy the needs of agriculture for a very long time. Till recently, however, **Nitrogen** was practically only to be had from the nitrate fields of Chile, and from ammonia, a by-product of the coal industry. Now that it is possible to extract nitrogen from the air, this fertiliser will become amply and cheaply available for agriculture.

Common salt is a necessary addition to a diet of cereals and vegetables or of boiled meat ; for the salts in meat are not lost when it is roasted or eaten raw. This salt makes up more than three-quarters of the salts dissolved in sea water ; and it is probably the evaporation of lakes and seas that has formed the deposits of rock salt, from which the greater part of our manufactured salt is obtained. Salt is apt to be scarce in tropical countries with a heavy rainfall. To primitive man it was an article of great value ; and the sources of its supply determined the sites of settlements and routes of trade.

Salt is also used as a raw material in the chemical industries, and enters into the manufacture of soap, glass, and bleaching products.

THE HARVEST OF THE ROCKS : MINERALS

Since minerals are brought to the surface of the earth by hot springs (p. 9), they are most likely to be found where disturbance of the earth's crust has allowed such springs an easy passage through the rocks. Such disturbances take the form either of " faults " or of " folds."

Faults are cracks in the crust of the earth, as the result of which a section of the crust either sinks to a lower level, or is pressed upward to a higher level. **Folds** are formed by the crumpling of the earth's crust. As both processes result in the formation of high land—block-plateaus in the one case, folded mountains in the other—minerals occur chiefly in highland areas, or in their neighbourhood. The mere fact of occurrence, however, is of less importance than the questions whether the deposits are sufficiently easy to work, and, whether, once the ore is mined, it can readily be transported to the place of manufacture. Thus mining, like wheat and beef production, tends to take place in a few special areas, where work can be done on a large scale.

Minerals, when slowly cooled and solidified out of a molten state, sometimes take the form of crystals. Certain of these, such as the diamond, which is a crystalline form of carbon, are valued as **gems** from their rarity and beauty.

Unlike other important minerals, coal has not been brought to the earth's surface by hot springs. At a certain period in the history of the earth, dense forests grew on the marshy coast plains of the continents then existing. These lands sank, and the trees died, and were buried deep in sediment; then between layers of rock this fossil vegetation was hardened and compressed in the course of ages into coal. Coal is classified by the amount of carbon it contains. Anthracite contains a great amount of carbon, has in consequence much heating value, and is almost smokeless. Bituminous coal, the common variety, has less carbon; and lignite, or brown coal, still less; while peat is coal still in the course of formation. Coal-fields, therefore, are found on the margins of ancient land areas.

Man has always been a manufacturer, from the days when he chipped flakes from pieces of flint to fashion tools and weapons. A new stage in the history of the world began, when he found that certain metals, when smelted with charcoal, could be beaten into any shape desired while hot, and after cooling became as hard as stone. Bronze, which is a mixture of copper and tin, was the first

CHARACTERISTICS AND USES OF METALS

Metal.	Characteristics.	Uses.	Chief Sources of Supply.
Iron .	Strength, magnetism, readily welded.	Wrought iron, cast iron, steel.	U.S.A., France, Germany, Great Britain, U.S.S.R.
Tin .	Air-tight, non-rusting.	Tinplate, alloy of bronze, gun-metal, pewter.	Malaya, Bolivia, Dutch East Indies.
Lead .	Soft, malleable, resists weathering.	Pipes, roofing, alloy of solder, pewter, paints.	U. S. A., Mexico, Australia, Canada, Spain.
Copper	More workable than iron, conductor of heat and electricity.	Electric and heating plants, alloy of bronze, brass.	U.S.A., Chile, Congo, Canada, Japan, Mexico.
Zinc .	Non-rusting.	Galvanising iron, paint, alloy of brass.	U.S.A., Poland, Belgium, Canada.
Gold .	Soft, malleable, does not tarnish.	Money, ornaments.	South Africa, Canada, U.S.A., U.S.S.R., Australia.
Silver	Bright, malleable.	Coins when hardened with copper, ornaments, films.	Mexico, U. S. A., Canada, Peru.

metal generally used in this way. A second advance was made when iron came into use instead of bronze, because iron is a harder metal, and is also more widely distributed than copper and tin. Steel is iron hardened by the addition of carbon, and generally made tougher by the further addition of other ores, such as nickel and manganese. Steel is used to-day for the making of buildings, ships, machinery,

and a vast number of other things. It is sometimes said that we live in the Age of Steel. There has, however, within recent years, been an increasing use in new industries of metals other than iron, such as copper in the electrical industry, zinc in the manufacture of brass, galvanised sheets, and type metal, lead for paints and solder, silver for moving picture films, aluminium for the construction of aeroplanes and household utensils, and chromium for stainless steel.

SOURCES OF POWER

Manufacturing industry as we know it to-day dates from the use to drive machinery of **steam power**, generated by heat from **coal**, instead of water-power, obtained from mountain streams. Districts round coal-fields then became great industrial areas, because it was cheaper to bring raw materials to the coal-fields than to take coal to those centres where raw materials were produced. When it was found that machinery could be driven by **electricity** instead of by steam, and that electric power could be transmitted at little cost by cables for great distances from the power-station where it was generated, it became less necessary for industries to be situated in the neighbourhood of coal-fields.

It was discovered also that electricity could be generated by **water power** instead of by steam power. Where a stream of water can be made to fall from a height through a narrow outlet with sufficient force and regularity to cause the rotation of turbines, these can be used to drive dynamos. Countries without coal-fields, but well supplied with water power, such as Italy, Sweden, and Switzerland, thus became better able to engage in manufacture.

A third source of power for industry is **petroleum**, or rock oil. From crude petroleum are obtained petrol, kerosene, used for lighting, lubricating oils, and fuel oils. Forty-two out of every hundred sea-going ships to-day either burn oil fuel or are motor-driven vessels; fifty-six out of every hundred still burn coal. Petroleum is conveyed

by pipe lines from the oilfields to refineries situated on the coast, whence in "oil tankers" it is shipped overseas.

Nearly nine-tenths of all the coal mined comes from lands on either side of the North Atlantic Ocean, from North America and from western and central Europe, while nearly four-fifths of the world's output of petroleum comes from countries bordering the Gulf of Mexico and the Caribbean Sea. North America also possesses nearly half the world's developed water power, Italy and France holding third and fourth places after the United States and Canada. In the countries of western and central Europe and of North America, because they are rich in these means of producing industrial power, great centres of manufacture have become established.

LOCATION OF MANUFACTURES

What factors determine the localities where such centres of manufacture come into existence? We find an answer to this question in the history of the establishment of the iron industry in Scotland. In 1760 the Carron Ironworks were founded on the Carron River, which enters the Firth of Forth at Grangemouth. The river supplied water power for blast furnaces; iron was available near by at Bo'ness; and the site was convenient for obtaining both timber from the Highlands for air furnaces and coal from Fife for blast furnaces. As the principal market for manufactured iron goods was in England, a regular service of sailing vessels was arranged between Grangemouth and London; and, as skilled workmen could not be had in Scotland, furnacemen and forgemmen were brought from England to teach the Scots.

The Ironworks, then, were placed at Carron because of the following advantages: (1) power for the industry was available on the spot; (2) there was easy access to raw material; (3) cheap transport could carry the manufactured products to the market. These three factors are essential for the successful establishment of any industry. Had there been experienced workmen, however,

in any other part of Scotland that offered the same advantages, it is likely that the Ironworks would in preference have been started there; because new industries are attracted to centres where there is a local supply of skilled labour. Further, the presence of skilled labour and of existing factories helps to root an industry in its locality even when the local supply of raw material has been exhausted. We shall meet examples of this tendency when we study the manufactures of Great Britain and the United States.

DISTRIBUTION OF POPULATION

We are now in a position to estimate the main factors which determine the distribution of mankind over the globe. If we study Fig. 10, we shall see that people live in great numbers (more than 100 persons to every square mile) in two types of Regions. In eastern and southern Asia and in Egypt they live in what are, broadly speaking, the rice-growing lands of the Monsoon and Tropical Regions. In Europe and in eastern North America they live in those lands which we have just noted for their development of manufactures—lands, moreover, which are situated in that belt of cyclonic rainfall that provides the type of climate most favourable to human health and activity (p. 27). We may say that Europe and eastern North America contain large populations because their type of climate has encouraged mental and physical activity, which in turn has utilised the Harvests of these and other lands to produce many different kinds of manufacturing industries.

Next, notice the position of those areas that are most scantily populated, with less than one person to every square mile. These are mainly either cold lands, within or adjacent to the Polar Regions, or else they lie within the Trade Wind belts, on the western side of great land masses, and therefore receive very little rain (p. 23). The one great exception is the heart of South America, which is thinly populated not because it has too little rain, but

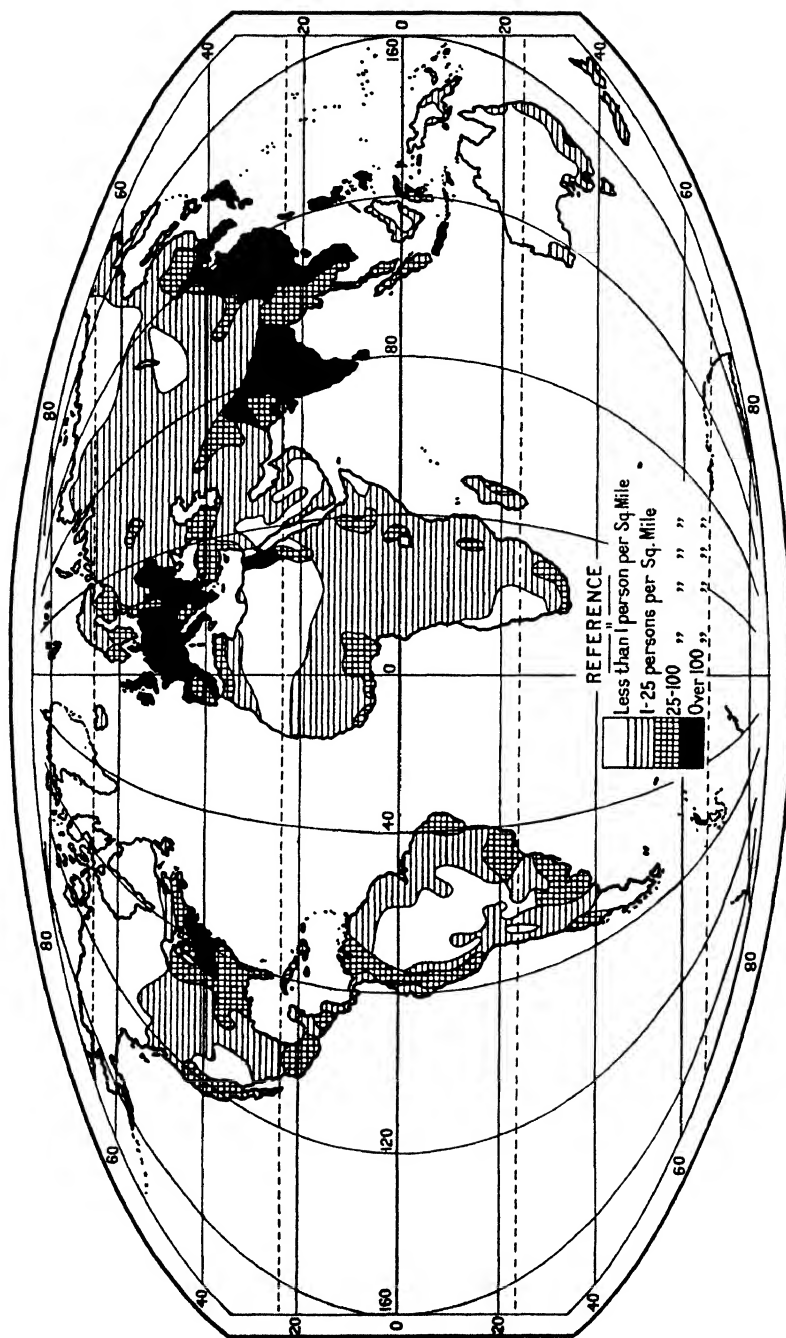


FIG. 10.—The World : Distribution of Population.

because it has too much, and, being low-lying land with a hot climate, is covered with dense Tropical Forest.

If we further compare Fig. 4 with Fig. 10, we shall see that lands within the Warm Temperate Regions, generally speaking, contain a moderately dense population of between 25 and 100 persons per square mile ; and we shall remember that several important crops are suited either to the Winter Rain or to the Summer Rain countries of these Regions.

Lands within the Torrid Zone, on the other hand, except rice-growing areas, have in most cases only a population of between 1 and 25 persons per square mile. We have already noticed a large part of tropical South America, where the population is even more scattered. We know that lands in the Torrid Zone, outside the rice-growing countries, produce few commodities that are handled in large quantities by Commerce. There are some areas where the population is greater than 25 persons to the square mile ; but these lands stand at a considerable height above sea-level, and therefore do not have a typically tropical climate.

EXERCISES IV

A

1. Which metals are used in the following industries : electrical, bridge-building, aeroplane construction, cannery, plumbing, photographic, shipbuilding, cutlery, electro-plate ?
2. From Fig. 10 name the more important regions that fall into the four groups indicated.
3. What are the main raw materials of power for manufacturing purposes, and which countries are the chief producers ?

B

1. Write a note on the importance of discoveries which have increased man's profit from the Harvest of the Rocks.
2. In what ways does the Harvest of the Rocks affect the yield of the Harvest of the Surface of the Earth ?
3. Discuss the various factors which lead to the localisation of industries, illustrating your answer by any example known to you.

4. Explain why tropical countries in general are thinly peopled and take a relatively small part in world trade, while monsoon countries are thickly populated and contribute largely to world trade.
5. Trace out the history of a local industry in the same way as the text gives that of the foundry at Carron.

CHAPTER III

TRANSPORT

QUANTITY AND SPEED

TRANSPORT is the process of conveying goods from the district where they have been produced to that where they are to be used. On p. 7 we have mentioned the chief classes of goods that require Transport to-day ; and we have seen in Chapter II. that the principal food-stuffs, the chief raw materials of industry, and manufactured goods all tend to come from a few localities, where conditions for their production are specially favourable. Modern long-distance Transport is mainly concerned with conveying large quantities of a relatively small number of bulky commodities between a few great centres of production and the markets where their goods are sold. This production of goods on a large scale for distant markets depends upon cheap and rapid Transport ; and such Transport became possible only about a hundred years ago. The first steamship crossed the Atlantic in 1819 ; the first railway for general purposes was opened in 1825 ; the first submarine cable came into use between Dover and Calais in 1851.

Before these inventions brought about the present concern of Transport mainly with **necessities**, each part of the world was largely self-sufficing, raising its own food and manufacturing for a local market ; and long-distance Transport was concerned principally with **luxuries**. As it was then possible to carry only small quantities of goods and at a slow rate, only in the case of articles that were very valuable in proportion to their bulk did the expense of such a method of conveyance not make the cost of the article more than the purchaser would pay. To overcome this disadvantage **man continually sought**—and still seeks—

to convey goods in greater quantity and at a faster speed. Even to-day primitive Transport methods are still found in many parts of the world ; for modern methods have been introduced only where the amount of trade is sufficiently great to make worth while the expense of tunnelling mountains, bridging rivers, constructing harbours, and overcoming such various obstacles as distance, drought, and disease.

LAND TRANSPORT

The simplest means of Transport is the **human porter**—a means still employed on a small scale in our own country, and on a large scale in mountainous lands, such as the Himalayas, and in lands where transport animals are scarce, either because, as in Central Africa, they are liable to disease, or because, as in parts of China, all the food that can be grown is required for human beings. As with most methods of Transport, the human porter can carry either a smaller load a longer distance, or a greater load a shorter distance. A Tibetan porter carries 200 lb. of tea six or seven miles a day over mountain roads for perhaps 120 miles, while caravans of African negroes travel eighteen to twenty-three miles a day, each porter bearing a load weighing 50 to 60 lb.

With the introduction of **pack-animals**, and still more with the use of animals for **drawing vehicles**, a great advance became possible, both in the amount of goods transported and in speed. For either purpose the horse is, in general, far the most serviceable of all animals ; but it is not suited to hot and moist countries, where it is replaced by different breeds of cattle and by the elephant, nor to hot and dry countries, to which camels and donkeys are better adapted, nor to mountainous countries, where mules, yaks, and llamas are used. In snowy lands its work is done by the Eskimo dog and the reindeer. The average load for an ox in India or a single-humped camel in North Africa is about 330 lb. The Bactrian, or two-humped camel of Central Asia, can carry more than twice this weight. A

camel caravan, which may contain hundreds of animals, travels about 25 miles a day. A horse can carry only 200 lb. on its back, but harnessed to a wheeled vehicle can draw 2 to 2½ tons.

The horse was probably first used for draught by nomad peoples on the grassland of Central Asia ; and it is likely that the earliest form of vehicle was a sledge. **The invention of the wheel** increased both the carrying capacity and the speed of Transport, and later led man to gear wheels together so that his animals might grind grain and draw water. From such uses of the wheel to save human labour originated our present universal employment of machinery. The heaviest load can be carried in a wheeled vehicle at the best speed on a level surface, which in most countries makes necessary the construction of **roads**. Road-making, like other modern aspects of Transport, is a very recent development. There was no road-making in Europe worthy the name between the time of the Romans and the end of the eighteenth century ; and suitable material for the construction of roads is not everywhere available.

So deep were the ruts worn in the roads that, as early as the sixteenth century, planks of wood were laid on roads to make tramways, on which coal from the Newcastle pits could be brought to the Tyne for shipment. Later the wooden planks were replaced by iron rails, and the wooden wheels of the horse-drawn wagons by iron wheels. Modern **railways** came into existence when it was realised that such tramways could be used to transport general merchandise as well as coal, and when Stephenson invented a steam-engine that could draw a train of wagons. What Transport has gained from railways in carrying capacity and speed is apparent from the facts that single railway trucks are now constructed to carry a load of 40 or even 80 tons, and that several trains in Great Britain have a non-stop run of 50 miles at the rate of 50 miles an hour.

A still later development is the use of roads for **motor traffic**. As there are 177,000 miles of public roads in Great Britain compared with 19,000 miles of railway, motor

transport has a freedom of action which increases the ability of Transport to convey certain classes of goods direct from the producer to the consumer. This avoids the expense and delay caused by "breaking bulk," when it is necessary to change from one kind of Transport to another. By means of such devices as a caterpillar track to serve the same purpose as the camel's widespread foot, motor-cars are enabled to cross desert sands.

INLAND WATER TRANSPORT

Rivers were the main traffic routes of Europe during the centuries between the road-makers of Roman times and those of the eighteenth century, and have been useful in the opening-up of new countries ; but to-day inland waterways, whether rivers or **canals**, are much less valuable for Transport than railways and roads. Rivers have the disadvantages that in navigable stretches of their course they are apt to flow through marshy country where goods cannot be shipped or unloaded ; that their depth varies in dry and wet seasons ; and that in winter navigation may be stopped by ice. On canals the average rate of transport is three or four miles an hour, and is greatly reduced by the delay of passing through locks ; while most canals, having been constructed many years ago, are too small for modern requirements. Inland waterways do, however, possess great value for the carriage of bulky, non-perishable goods in low-lying districts. Rivers are also useful in mountainous country as a means of transport for timber ; while their valleys in many cases provide the most accessible routes for roads and railways to follow. Hence the meeting-place of two valleys is usually also a **node**, or knot, of routes, and the site of a market town.

OCEAN TRANSPORT

Movement on railways, roads, and inland waterways can only take place in two directions, and the size of vehicles or vessels is also limited. These disadvantages restrict sea and lake Transport also, but to a less extent.

Water offers less resistance than land to the friction of motion, so that ocean vessels can be larger than land vehicles. The depth of the harbours and sea-canals they are to use governs the size of ships, but within wide limits. The **liner** voyages between definite ports in accordance with a fixed time-table; and only harbours with large docks, ample space for handling and warehousing, and good rail and road communications inland can deal rapidly with bulky goods. On the other hand, **tramp steamers**, which carry perhaps one-quarter of the world's cargoes, have a wide choice of ports at which to load up for their return voyages. Such tramp steamers usually have a cargo capacity of 1000 to 6000 tons, and a speed of 9 to 10 knots ($10\frac{1}{2}$ to $11\frac{1}{2}$ miles) an hour.

Special types of vessel are built for particular cargoes. Ships with refrigerating installations carry chilled and frozen meat; oil-tankers transport petroleum in bulk; ore carriers have large hatches and holds and devices for rapid transfer of cargo. Countries that export large quantities of ore or coal, and import products, such as meat, which are profitable in proportion to bulk, can afford to carry their outward cargoes at a low rate instead of having their ships sailing in ballast.

Man's constant desire for greater speed has also led to the shortening of ocean voyages by the cutting of the Suez Canal through the land connection between Asia and Africa, of the Panama Canal through the isthmus joining North to South America, and of the Kiel Canal between the North and Baltic Seas.

As the meeting-place of river valleys is usually the site of a market town, so also the terminal ports of ocean routes, where goods must break bulk in order to be transferred to land transport, usually develop as trading and manufacturing cities.

OCEAN ROUTES IN THE PAST

Civilised states first became established in the valleys of the Nile, Tigris and Euphrates, Indus, and Hwang Ho, and

from these centres civilisation spread over neighbouring lands in Europe, India, and China. By the time of Queen Elizabeth there were probably more than 70,000,000 people both in Western Europe and in China, and 100,000,000 in India. For centuries previously the main trade route of the world had run east and west between these densely populated lands along the **natural highway of the Mediterranean Sea**, on the east end of which converged the land routes of the silk trade across Central Asia from China and the sea routes of the spice trade up the Persian Gulf and the Red Sea. The capture of Constantinople in 1453 by the Turks, who were fiercely anti-Christian, closed this ancient trade route, and set the sea-faring nations of western Europe on a search for new routes by which they might reopen trade with eastern Asia.

The typical ship of Mediterranean countries in ancient and mediæval times was the **galley**, which depended for handiness upon rowers, though generally carrying a mast and sail. In northern waters the Norsemen used the galley to discover Iceland, Greenland, and North America ; but this was not a suitable vessel for ocean voyages, especially when manned largely by slaves. In the fifteenth century, however, appeared a new type of ship—the **galleon**, which in speed and sea-worthiness was far superior both to the galley and to the sailing ships which were used for trade. At first the galleon was a one-masted vessel with a square sail, and so could use only a following wind. After 1466 ships began to be built with three masts ; and before the end of the century Columbus crossed the Atlantic and Vasco da Gama sailed round the Cape of Good Hope to India. Without this invention of **the three-masted ship**, with her greater ability to sail against contrary winds, the world would never have been explored.

The British Empire was founded in the days of sail, and most parts of the Empire lie close to one or other of two great sailing routes of the globe. These are the **Cape of Good Hope route to India** and the **Trade Wind route across the Atlantic**, with return by the Westerly Winds,

When England began to engage in world commerce, merchants first sought ports at the far end of trade routes, where agents could collect goods to be carried home. Such a purpose was served by the English factories in India at Calcutta, Madras, Bombay, and in America by the colonies in New England and Virginia. But the voyages were long and dangerous, and it was soon found necessary to acquire ports of call at intervals along each route. Such were Cape Town, Mauritius, and Trincomalee in Ceylon on the route to India, and several of the West Indian Islands on the Atlantic route. The Atlantic route took a triangular shape (Fig. 11) with the establishment of factories in West

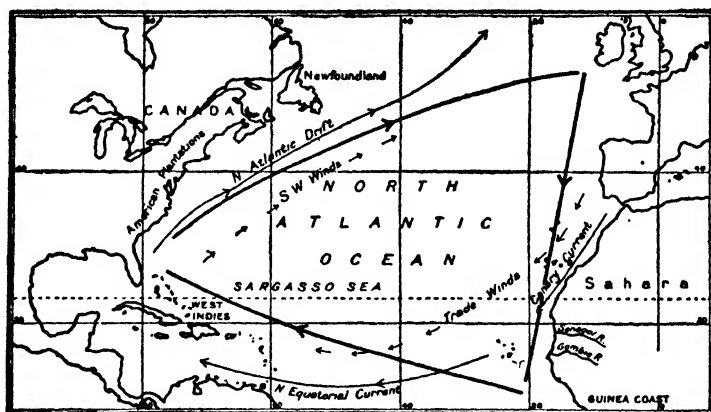


FIG. 11.—Triangular Trade Route of the Atlantic.

Africa at the mouth of the Gambia and at Cape Coast Castle on the Gold Coast. Ships sailed from Bristol or Liverpool, exchanged spirits, ornaments, and manufactured goods for African negroes, sold their human cargo in America, and came home laden with sugar, rum, cotton, or tobacco. From these factories and ports of call British control spread inland over vast territories in India, South and West Africa, and North America.

In the first half of the nineteenth century **iron replaced timber** as ship-building material, to be still later replaced by lighter and more durable steel, and **steam** became the motive power for vessels **instead of sail**. The wind belts

of the world ceased to control the routes of ocean traffic, which now as far as possible follow Great Circles.¹ Fuelling-ports supply coal or oil on these modern routes, as ports of call supplied fresh water and food in the days of sail. These changes again brought increases in carrying capacity and speed. Ships increased in size from the 150 tons of Drake's *Golden Hind* and the 366 tons of Cook's *Endeavour*, to the 40 to 50,000 tons of the modern liner, which in five or six days from port to port makes the North Atlantic crossing that took sailing ships several weeks.

The change from sail to steam brought about a **revival of the Mediterranean route to the East**, combining sea voyages from England to Alexandria and from Suez to India with an overland route across Egypt. The overland link was replaced in 1869 by the opening of the Suez Canal, which shortened by 4000 miles the voyage from England to India, as compared with the route round Africa. On this route Great Britain already, previous to the opening of the Canal, held fortified naval ports at Gibraltar, Malta, and Aden. Her interest in keeping free from interruption navigation through the Canal led to British occupation of Cyprus, Egypt, the Sudan, Palestine, and Transjordan.

OCEAN ROUTES TO-DAY

How far do these three seaways, that provided the framework on which the British Empire was built up, retain their importance under modern conditions? Between what lands does Trade chiefly take place? As British ships make up about three-tenths of all the tonnage of the world, an examination of the routes upon which they are employed will supply answers to these questions. Fig. 12 has been prepared from information given in a book by Professor A. J. Sargent, *Seaways of the Empire*. From this map it is evident that British vessels carrying cargoes

¹ Great Circles divide the globe into two halves, and give the best distance between any two points. All meridians are half circles, but the only parallel of latitude that is a Great Circle is the equator.

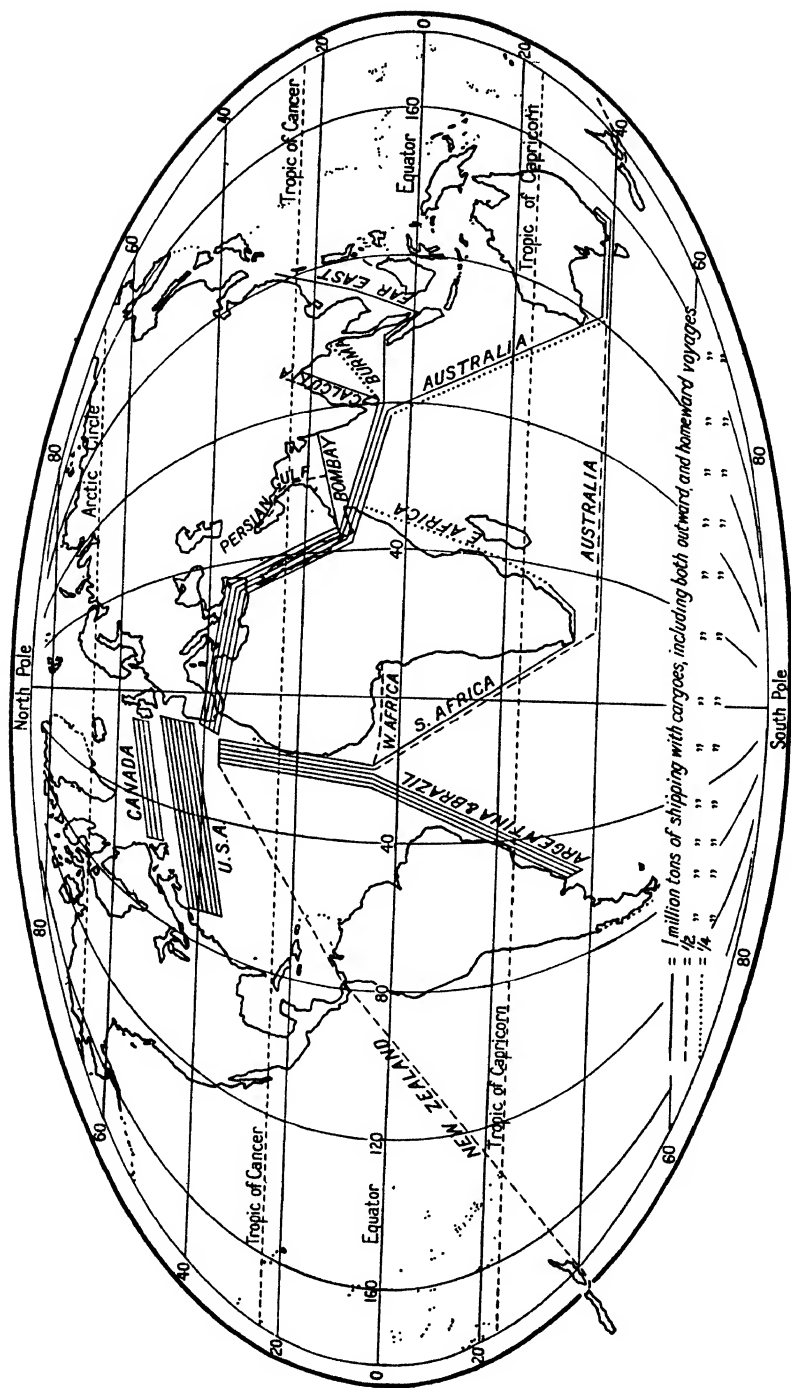


FIG. 12.—Seaways of the Empire.

over ocean trade routes amounted to a total of nearly 24,000,000 tons in one year. Not all these cargoes came from or were directed to British ports, some belonging to European countries on the shores of the Mediterranean and the North Sea. How was this tonnage distributed? We find that :

- (a) One-half was employed in the North Atlantic in trade with the United States and Canada ;
- (b) About one-sixth passed through the Suez Canal to and from the Persian Gulf, India, Burma, and the Far East ;
- (c) About one-third crossed the Equator, bearing imports to and exports from lands of the Southern Hemisphere, being divided nearly equally between countries of the British Empire and South American ports.

With the exception of vessels trading with New Zealand, British shipping makes little use of the Panama Canal ; nor is it much employed on the North Pacific route between the Pacific ports of the United States and Canada and the monsoon countries of eastern Asia.

If we now compare Fig. 12 with Fig. 10, we find that trade takes place to-day, as in the past, chiefly between those countries that have the greatest populations. Areas with few inhabitants produce little to sell, and have little money to spend. But we can realise that man has been so successful in increasing both the carrying capacity and the speed of Transport that all parts of the world are now linked together more or less closely by Commerce, and that their inhabitants are not only citizens of their own countries, but are, in addition, Citizens of the World.

AIR ROUTES

The thirty years since the brothers Wright first flew an aeroplane under its own power have seen immense development in Transport by air. Delhi and Cape Town have been brought within eight days' journey of London by regular services of aircraft, and a French air line connects

Paris with West Africa and South America. Overland there are networks of air routes in Europe and North America, and in South America, Africa, and Australia they are being extended in areas where other methods of rapid transport do not exist. Aircraft do not, of course, compete in the carriage of heavy goods with railways or ocean liners. Their special value is for the conveyance of mails, passengers, and articles of small bulk but much value, such as gems and precious metals.

EXERCISES

A

1. In what parts of the world is each of the following animals used for transport, and what goods does each convey : elephant, llama, reindeer, yak, donkey, ox, horse, camel ?
2. Describe (a) the " journey " of a pint of milk from the farm to your breakfast table ; (b) the " journey " of a herring from the sea to the fish shop.
3. How many times greater a load (approximately) than that of an African porter can be transported by (a) a camel ; (b) a horse harnessed to a cart ; (c) a railway train with ten 40-ton trucks ; (d) a tramp steamer with a cargo capacity of 1000 tons ?
4. Mention one important product that reaches Great Britain from each of the following : Canada, the United States, Brazil, Argentina, West Africa, South Africa, East Africa, Egypt, China, Australia, New Zealand.

B

1. Explain why the chief articles of Commerce in ancient times were luxuries, while to-day they are necessities. Give examples of each. What modern method of Transport is specially suited to the carriage of luxuries ?
2. (a) What were the main ocean trade routes of the eighteenth century ?
(b) What are those of the present day ?
3. What inventions in Transport made possible the raising of wheat and meat on a large scale on the great grasslands of North and South America and Australia ?
4. What difficulties have to be overcome in the export of : bananas, mutton, iron ore, eggs, lettuces, oranges ? How are they overcome ?

CHAPTER IV

SOUTH AMERICA

POSITION, SIZE, POPULATION

SOUTH AMERICA is nearly twice as large as Europe ; but its population of 80,000,000 is less than the combined population of Germany and France. It has fewer inhabitants than any other continent except Australia ; and these inhabitants are not evenly distributed over the continent. About one-third of the population lives on the lowlands, which occupy about two-thirds of the total area ; and two-thirds lives on the highlands (over 1000 feet above sea-level), which occupy one-third of the total area. Why do more people live on the highlands than on the lowlands ? Are the highlands more important than the lowlands in respect of trade ?

From its triangular shape and position on the globe, between latitudes 12° N. and 55° S., about three-quarters of the whole continent lies within the Tropics, a larger proportion than in any other continent. The southern portion which tapers towards the apex of the triangle is the only part of South America which lies in the Temperate Zone. Height above sea-level, however, gives a cooler climate, and compensates for position in a low latitude. Bogotá, the capital of Colombia, situated 4.35° N. of the Equator at an altitude of 8650 feet, enjoys as cool a climate as does São Paulo in Brazil, situated practically on the Tropic of Capricorn at an altitude of 2250 feet.

HIGHLANDS

Highland areas in South America are, on the east, three important plateaus, Guiana, Brazil, Patagonia ; and on the

west the long mountain chain of the Cordillera. The lowlands consist of the valleys of the Orinoco, Amazon, and Plate Rivers.

(1) North of the Equator the **Guiana Plateau** extends for 1000 miles from west to east and, at its broadest, for 600 miles from north to south. As it lies in the heart of the Torrid Zone and at a considerable distance from the coast the Plateau is densely forested, has been little explored, and is of very slight economic importance.

(2) South of the Equator the whole eastern angle of the continent is occupied by the **Brazilian Plateau**, which covers 1,000,000 square miles in area and stands from 2000 to 4000 feet above sea-level. The height of that section of the Plateau which lies approximately south of 20° south latitude is sufficient to secure for that area a Warm Temperate climate.

(3) South of 40° S. the eastern half of that portion of the continental triangle which tapers towards the apex at Cape Horn is occupied by the **Plateau of Patagonia**.

These three highland areas have been dissected into uplands and valleys by the action of rivers, and show the general characteristics of such **Dissected Plateaus** :

(a) Hard, ancient rocks, to which is due their preservation as highland regions ;



FIG. 13.—Regions of South America.

- (b) Steep descent of their rivers from the plateau edges to the lowlands and to the coasts ;
- (c) In consequence, a general absence of easy means of access from the lowlands and coasts to the interiors of the plateaus ;
- (d) Regular, unbroken, coast-lines, with a general lack of good natural harbours.

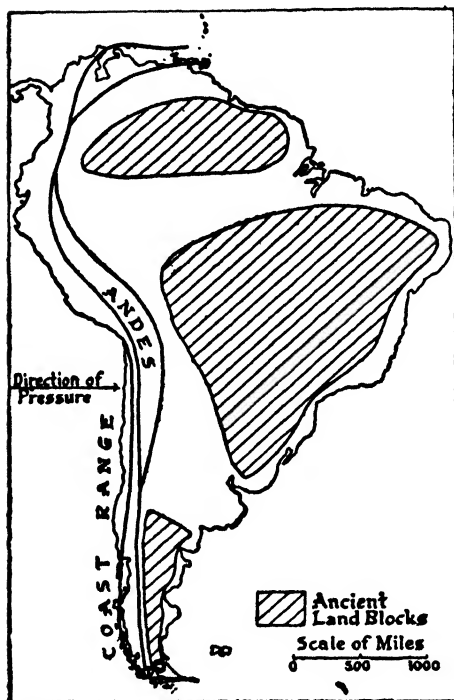


FIG. 14.—South America : Structure.

(4) At a certain period in the Earth's history disturbances took place in the earth's crust. From the direction of the floor of the Pacific Ocean pressure was exerted from the west, but this movement eastwards was resisted by the three ancient plateaus. Thus a ridge was formed called the **Cordillera** system of folded mountains, which lies parallel to the whole western coast of South America. The Cordillera consists of the magnificent chain of the Andes, and of certain other ranges, of which the most important is the Coast

Range of Chile, lying parallel to the Andes on the west, separated from them by the Central Valley of Chile.

The **Andes** are a mountain system that for length, height, and continuity is without its equal in the world. For 3500 miles of its length it is crossed by few passes that are as low as even 12,000 feet. In its southern section it forms a single mountain chain ; northward of the latitude of Valparaiso the chain begins to broaden out, and breaks

up, unites, and re-divides again into sometimes two, sometimes three, distinct ranges of lofty mountains, which enclose between them a series of high plateaus. About 24,000,000 people live in the region of the Cordillera and on the Pacific coastal plains.

LOWLANDS

Both western folded mountains and eastern plateaus are situated so near their respective coasts that on the west coastal plains are either very narrow or entirely absent, and on the east the coastal plain is narrow except in the Pampa district of Argentina. Only on the north coast, from the delta of the Amazon to the Isthmus of Panama, is there a wide coastal plain.

The Cordillera system lies so close to the west coast that no river of any importance can drain to the Pacific. Also, because of the general distribution of the highland areas near the coasts, all great South American rivers are forced to flow inwards from the highlands towards the interior of the continent, before they can collect the waters of their drainage basins, and turn outwards to the ocean through relatively narrow gaps between the blocks of highland. There are three main drainage systems, and hence three Lowlands.

(1) The **Orinoco** rises in the south-west of the Guiana Plateau, curves round the western end of the Plateau, and flows to the Atlantic across the low, flat plains known as the **Llanos** ("flat lands"). The river is unsuitable for navigation by ocean steamships, because its maximum depth at high-water is only eleven feet. Navigation is completely interrupted by the Atures Rapids 600 miles from the sea.

(2) The main stream of the **Amazon**—known in its upper section as the Marañon—rises in the eastern Andes, but its chief navigable tributary, the Madeira, curves round the western end of the Brazilian Plateau, as the Orinoco curves round the Plateau of Guiana. The drainage basin of the Amazon is 2,500,000 square miles, or five-sixths of

the area of the United States. No other river in the world carries so great a volume of water to the sea. The Amazon itself is navigable for ocean-going vessels to Iquitos, 2000 miles from its mouth ; but continuous navigation on its tributaries is broken by rapids, where the rivers leave the Brazilian and Guiana Plateaus for the Amazon Lowland. About half this vast drainage basin is less than 500 feet above sea-level. Its soil is partly flood plain, laid down by the rivers and liable to inundation yearly, partly higher ground lying farther back from the streams or standing as bluffs above their course. Upon such bluffs the scattered settlements of this region are built.

(3) The Pilcomayo, which rises in the Central Andes, and the Paraguay and Paraná, which have their sources on the Brazilian Plateau, flow southward to unite under the name of the Paraná, and enter the Atlantic as the Rio de la Plata, or **Plate** River. There is a regular service of freight steamers 1000 miles up the Paraná-Paraguay to Asunción, the capital of Paraguay. North of 30° S. latitude the lowlands of the Plate basin, between the Paraguay-Paraná and the Andes, are known as the **Chaco** (=the hunting-ground) ; south of 30° S. stretches a land of level surfaces and fertile soil known as the **Pampa** (=the plain). The Plate basin is smaller than that of the Amazon ; but, lying partly within a Warm Temperate Region and only partly within the Tropics, contains a population of 17,000,000 people, whereas the Amazon basin, lying entirely in the Torrid Zone, contains a population of about 4,000,000.

Our examination of the surface relief of South America has thus shown that there are four highland and three lowland regions, of which two highland regions—the Brazilian Plateau and the Cordillera—contain even within tropical latitudes areas whose altitude secures them a climate sufficiently cool to make them attractive for settlement, while the greater part of the one lowland region—the Plate Lowland—that contains a considerable population lies in the Temperate Zone.

RAINFALL

Most of South America lies within the North-east and the South-east Trade Wind belts, with the Equatorial belt between. During both northern and southern winter, the land is not much colder than the sea (p. 15), and does not

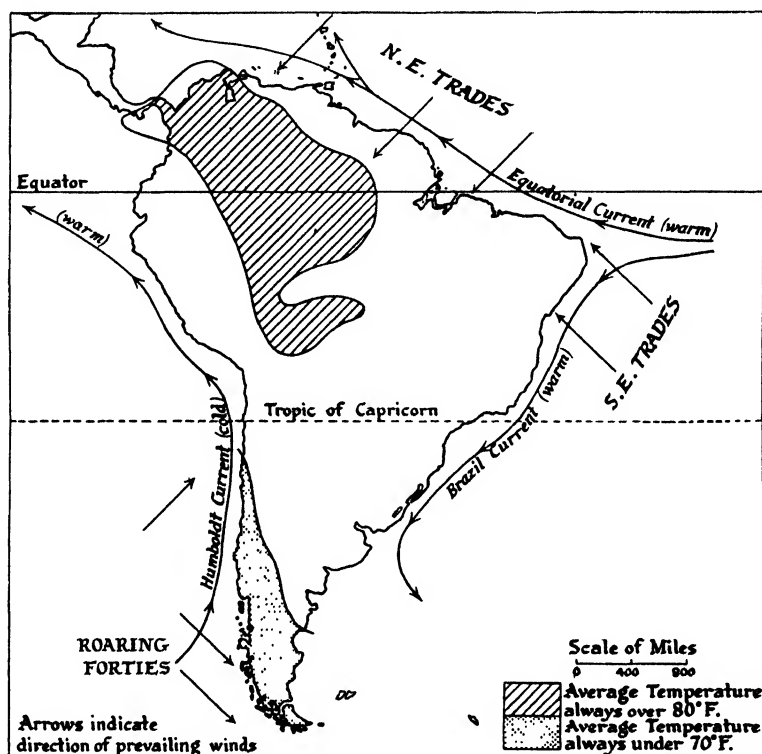


FIG. 15.—South America : General Climatic Factors.

lower the temperature of the Trade Winds, when they reach it, sufficiently to compel them to part with the moisture they bring. Winter rainfall over the greater part of South America is, therefore, slight. The Brazilian Plateau in July and the Guiana Plateau in January are markedly dry. During both southern and northern summer, on the other hand, the Trade Winds blow from water which is warm but not so warm as the land, which they reach as moisture-

bearing winds. On their course landward they pass over the warm Equatorial and Brazil ocean currents, become still warmer, absorb further moisture, and reach the coasts fully laden with water vapour. As they meet the plateau edges, they are forced to rise, become chilled, and precipitate orographical rain. On the plateaus they are again warmed by the hot land, rise still higher, and thus cooled, they part

with further moisture over the plateau as convectional rain. Thus, in July the coastland on either side of the Orinoco, and in January the valley of the Amazon, experience very heavy rains. Hence the saying that "**the rain follows the sun.**"

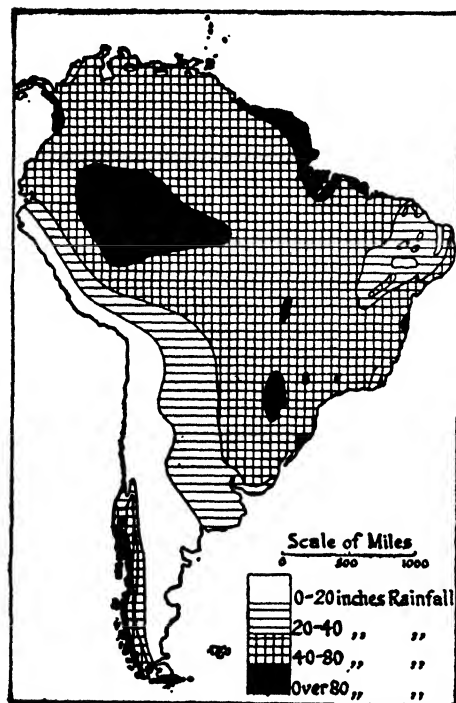


FIG. 16.—South America : Annual Rainfall.

The Cordillera interferes with the full movement of the rain-bearing Trade Winds. They are compelled to rise to such a height that they must part with all the moisture they still carry when they reach this lofty continuous mountain range. The result is that, while the eastern slopes and

summits are drenched with a heavy rainfall, none reaches the western coast beyond. From the Gulf of Guayaquil to Copiapo (27° S.) is a fringe of desert, known in its southern portion as the **Desert of Atacama**.

The southern part of the continent, as far north as 36° S., comes within the influence of constant rain-bearing Westerly Winds—the Roaring Forties. Here again the Cordillera interferes with their free movement. Forced to

rise to cross the mountains, they reach the Patagonian Plateau as drying winds, and sweep across its surface, stripping away the soil and leaving behind them a desert of rocks and stones. Thus we have the **wetter lands to windward** and **drier lands to leeward** in both the Trade Wind and Westerly Wind belts, the natural tendency towards this result having been assisted by the influence of the Cordillera in producing Rain Shadows (p. 24).

Between 27° S. and 36° S. lies that area of the continent which comes under the influence of the Trade Winds in summer and the Westerly Winds in winter. The Coast Range and the Central Valley of Chile have, therefore, winter rain and summer drought ; while, east of the Andes, the Pampa of the Plate Lowland has summer rain and winter drought.

EXERCISES I

A

1. Find on your map the position of :
 - (a) Mounts Aconcagua, Chimborazo, Sorata, Cotopaxi.
 - (b) The Equator, Tropic of Capricorn, Magellan Strait, Trinidad, Juan Fernandez, Isthmus of Panama, Lake Maracaibo, Falkland Islands, South Georgia.
 - (c) Trace the courses of these rivers ; Amazon-Negro-Madeira ; Orinoco ; Paraguay-Paraná-Uruguay-La Plata.
2. On a blank map insert these names over the areas noted for their occurrence : south-east trade winds, north-east trade winds, westerlies, rain-shadow, desert, cyclonic, orographical, and convectional rainfall.
3. Make out four columns as shown below to cover all the seven regions of South America. Fill in the first three columns, and complete the fourth when you have finished this chapter.

Region.	Climate.	Season of Rainfall.	Products.
Guiana Plateau	Tropical	Chiefly in summer	

B

1. What regions are exceptions to the rule that " the rain follows the sun," and why ?

2. On three-fourths of the shore-line of South America the greatest height of the highland areas occurs near the coasts. How does this affect the rivers as means of communication? What section of coast is an exception to the above rule?
3. Cape Horn is approximately in lat. 56° S. and Edinburgh is in latitude 56° N. Contrast their climates and account for differences between them.

NATURAL VEGETATION

The main types of Natural Vegetation in South America are distributed as follows :

(a) **Evergreen Tropical Rain Forest** prevails in the

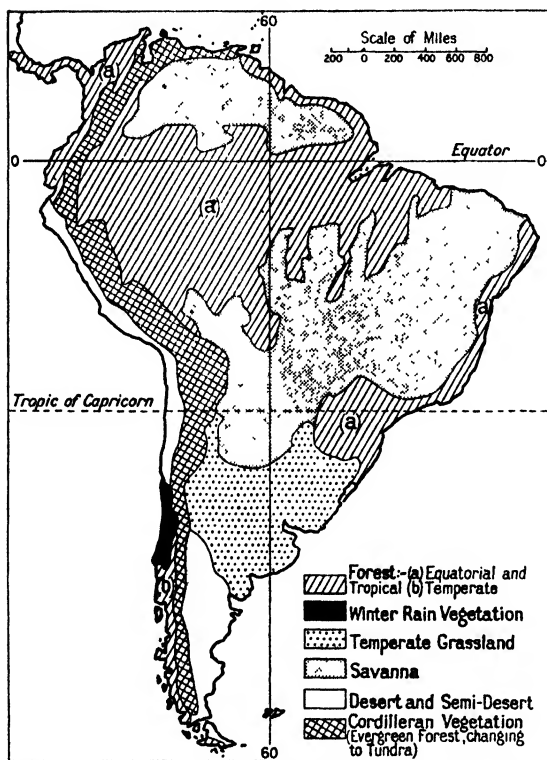


FIG. 17.—South America : Natural Vegetation.

Amazon Lowland, where it is known as the *Selvas* (= forests), and on the northern and eastern coastal plains, which receive specially heavy rainfall owing to the Trade Winds meeting the edges of the Guiana and Brazilian Plateaus.

(b) **Temperate Forest** clothes the western slopes of the Andes in Southern Chile, within the belt of the "Roaring Forties."

(c) **Savanna Lands** are the

Llanos of the Orinoco Lowland, part of the Guiana Plateau, the interior of the Brazilian Plateau, which is locally known as the **Campos** (= fields), and the Chaco in Argentina.

(d) **Temperate Grassland** occupies the Plate Lowland south of the Tropic of Capricorn and the southern section of the Brazilian Plateau.

(e) **Winter Rain Vegetation**, of the type that is particularly resistant to summer drought (p. 26), occurs in the belt of Winter Rains already noted as characteristic of central Chile.

THE PEOPLE OF SOUTH AMERICA

The plateaus of the Andes, thanks to their altitude, experience a cool climate. They supply level surfaces well suited for agriculture ; and such valuable plants as cotton, maize, pumpkins, and the potato grow there in a wild state, and are therefore available for cultivation. Here the Inca empire of Peru made the greatest advance in civilisation of all the Indian peoples of South America. The Incas built in stone and wrought in metals ; they constructed roads, brought water to irrigate the arid coastal plain, and tamed as a transport animal the llama of the Andes.

In his search for a new route from Europe to Eastern Asia the North-east Trade Winds carried Columbus to the Bahamas. His expedition was made with the help of Spain ; and the Spaniards claimed the new lands that he discovered. They established themselves first in the West Indies, then struck north-west at the Aztec empire in Mexico, and south against the Inca empire in Peru, greedy for the wealth of those countries in silver. From Peru they advanced south to Chile and Argentina.

Into South America they introduced European grains and fruits, wheat, barley, vine, fig, and olive, European domesticated animals, ox, mule, and ass, and the use of the plough. But they were mainly soldiers, priests, and fortune seekers, who despised manual labour ; and indeed, in tropical climates, Europeans cannot engage in heavy manual work. So they enslaved the Indians to work for them on the fields and in the mines, and lived as a small ruling class amidst a large Indian population.

In the early years of the nineteenth century the Spanish colonists in South and Central America rebelled, and formed independent states, the Andes providing a natural frontier between Argentina and Chile, and the Atacama Desert separating Chile from Peru.

While the rest of South America became Spanish territory, Brazil became Portuguese. The coastal districts were found suitable for the cultivation of sugar cane, which was introduced from Madeira ; and negro slaves were imported from the African Guinea coast to work on the plantations. Later, cattle were brought to the northern Plateau from the Cape Verde Islands. Sugar and cattle were a much more solid foundation for the Portuguese empire in South America than the Spanish empire possessed in its gold and silver mines. Brazil, like the Spanish colonies, secured independence early in the nineteenth century.

Portuguese is the official language in Brazil, Spanish prevails throughout the rest of South America ; but in race more than half the population of the continent is Indian, negro, or a mixture of these races with each other and with Europeans. These coloured and mixed races are largely uneducated, live simply, and have little money to spend. It is only in the more temperate climates of the south, in Argentina, Uruguay, Chile, and Southern Brazil, that populations, mainly or entirely white, form progressive communities, producing commodities of which the world stands in need, and forming valuable markets for the produce of other communities overseas.

EXERCISES II

A

1. Find on your map the positions of the states mentioned in Column I on p. 93.
2. Study Figs. 16 and 17. Say what rainfall and vegetation are characteristic of : Northern Chile, Central Chile, Uruguay, Guiana, Brazil.
3. What type of vegetation would you expect to cover South America north of the Tropic of Capricorn if it were all low-lying land ?

B

What geographical factors influenced (a) the discovery of the West Indies by Columbus ; (b) Drake's route round Cape Horn ; (c) the formation of independent states in Argentina, Brazil, Chile ?

THE PLATE LOWLAND : ARGENTINA AND URUGUAY

Before the Spanish conquest the Pampa Indian hurled his "bolas" at the guanaco (a kind of camel), ate its flesh, and clothed himself in its skin. With the introduction of horses and lean, bony Spanish cattle he turned into the "gaucho" cowboy, more hunter than herdsman, and the cattle meat, dried and salted as "jerked beef," went to feed negro slaves in Cuba and Brazil. Economic development really started after 1880, when the carcasses of sheep and cattle began to be shipped to Europe as frozen mutton and beef, and a great expansion of the **sheep and cattle industries** took place on the Pampa. This expansion of the cattle industry was greatly aided by extensive sowing of alfalfa grass. So gentle is the eastward slope of the Pampa, and so pervious the soil, that the rivers often disappear underground, and flow beneath the surface. Alfalfa draws moisture from this underground water, and enriches the soil with nitrogen, turning waste land into valuable fattening pasture. English Shorthorns and Herefords are imported to improve the breed of cattle, and Lincoln and Merino sheep to secure respectively better mutton and better wool.

Argentina and Uruguay supply about two-thirds of Great Britain's imports of refrigerated beef, mutton, and lamb, while Argentina is second only to Australia as an exporter of wool. The cattle industry is practically the sole occupation in Uruguay, and the state of Rio Grande do Sul in this region contains a large proportion of all the cattle in Brazil.

Cattle and sheep were kept on the great ranches, or "estancias," of the Spanish landowners. Agriculture owes its development in Argentina to immigrants, largely from northern Italy, who were prepared with their own

hands to cultivate the soil. Argentina to-day ships nearly one-fifth of the world's exports of wheat and flour, two-thirds of its exports of maize, and more than half its exports of linseed.

What is called the "**Wheat Crescent**" in Argentina—the area where wheat cultivation predominates—is limited in the north-west and north by too heavy summer rains, in the west by deficiency of moisture as rainfall decreases with distance from the sea, and in the south by both drought and low temperature. Within these limits, however, a vast

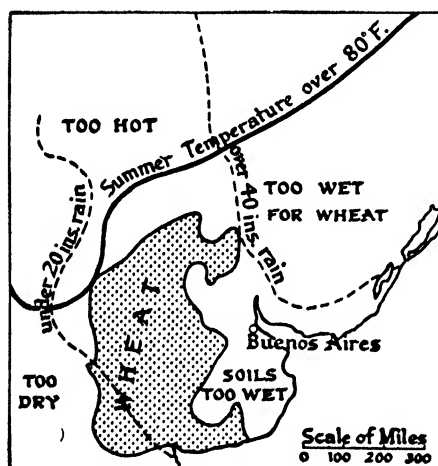


FIG. 18.—"Wheat Crescent" in Argentina.

area is suited for wheat production. The level plains allow the use of modern cultivators and harvesting machinery, and the situation of the Wheat Crescent within 300 miles of an ocean or river port gives a shorter rail-haul than in North America, where the wheat for export grows 1000 miles from the sea.

As **maize** requires greater warmth and heavier rains in summer

than wheat, maize in Argentina is most extensively grown between the Wheat Crescent and the head of the Plate estuary. **Flax** is sown generally throughout the wheat and maize areas, in rotation with both crops. In the drier lands farther west the **vine** is grown by means of irrigation in the oases of San Juan and Mendoza.

The Chaco is a low-lying region, wet in summer, dry in winter. Along the watercourses appears trips of quebracho timber—a hard wood valuable for building, for railway sleepers, and for fences. Cattle farming, cotton cultivation in the south, the raising of sugar cane in the irrigated districts of Tucuman and Jujuy, and the extraction of

tannin from quebracho bark on the west of the Paraná and Paraguay rivers, are the principal occupations.

The Plate estuary is the natural outlet for the products of the whole Plate Lowland; and the export and import trade of Argentina and of Uruguay centre upon their

Agricultural Products	Meat and Live Animals	Other Live-Stock Products	Other Products
52%	22%	21%	5%

FIG. 19.—Exports of Argentina.

capitals, **Buenos Aires** (pop. 2,148,000), and **Montevideo** (481,000). Both these cities contain more than a quarter of the populations of their respective states. Montevideo, at the mouth of the estuary, has a better situation as a commercial port than Buenos Aires, which stands 150 miles from open sea, and can be reached by ocean steamships only through dredged channels.

THE PATAGONIAN PLATEAU : SOUTH ARGENTINA

The two features of strong winds and drought are characteristic of the Patagonian Plateau and of the lowlands of Tierra del Fuego across Magellan Strait. **Sheep-raising** is the one main occupation in this region. Less than 150,000 people live east of the Andes and south of the Rio Colorado; but there are about 90 sheep for every human inhabitant. The establishment of freezing works at intervals along the coast has made possible the export of mutton as well as of wool. In the British colony of the **Falkland Islands** there are nearly 200 sheep per inhabitant.

THE SOUTHERN CORDILLERA : SOUTH AND CENTRAL CHILE

This is the region, as far north as 27° S., where the Westerly Winds bring rain either throughout the year or during the winter months. The **Central Valley of Chile**, between the Coast Range and the Andes, is the most densely settled and richest agricultural district on the

western coast of South America, because the winter snow that falls on the slopes of the Andes melts with the warmth of summer, and thus becomes available for **irrigation**. Wheat is the main crop, and regularly provides a surplus for export. Oats for horses and oxen, and potatoes as food for man, are grown in the cooler, more moist, southern part of the Valley; their place is taken in the drier northern portion by maize for forage, and beans, peas, and lentils for human food. Similarly, apples are grown in the south, and in the north grapes, lemons, oranges, quinces, and figs.

Nine-tenths of the population of Chile (nearly 4,000,000 people) live in the 600 miles length of the Central Valley. The capital, **Santiago** (pop. 696,000), lies in the Valley, fifty miles distant from its port, **Valparaiso** (193,000), which handles the bulk of the import trade. Chile possesses good supplies of iron and the principal coal-field in South America, the latter situated on the coast near Concepcion, 300 miles south of Valparaiso, and in addition could secure power from the streams of the Cordillera. These resources may at some future period bring about in Chile an important development of manufacture.

THE NORTHERN AND CENTRAL CORDILLERA : NORTHERN CHILE, BOLIVIA, PERU, ECUADOR, COLOMBIA, VENEZUELA

As far north as Chilean territory extends, the Andes act as a political and economic barrier. Farther north, on the other hand, the plateaus of the Andes are the homes of communities large enough to attach to them either or both the Pacific coastal plain on the one side, and the tropical valleys and plains which slope eastward on the other side into the Amazon Lowland. On these plateaus, standing 8 to 10,000 feet or more above the sea, and provided with level surfaces suitable for cultivation, are the capital cities of the states, **La Paz** (Bolivia), **Quito** (Ecuador), and **Bogotá** (Colombia). Though a minor part of their territories, these plateaus hold more than half the populations

of those three republics, and the same is true of Peru and Venezuela.

Lima (pop. 265,000), the Peruvian capital, is not situated on the Cordillera, but on the coastal plain near its port of Callao, because, in the days of the Spanish empire, Lima was collecting and distributing centre for all the trade of the Pacific colonies south of Panama. **Cuzco**, the old Inca capital, on the other hand, stands at an altitude of 11,000 feet.

In the highlands of Colombia and Venezuela **coffee** is grown for export, Colombia ranking second to Brazil as a source of world supply. On the coastal plain tropical jungle has been replaced by plantations of bananas. The coastal plain, practically rainless as it is, is also agriculturally important in Peru. Some fifty snow-fed rivers rise in the Andes and cross the desert to the sea. As they reach the plain their speed is checked, and they lay down as fertile flood-plains the silt which they have carried in their more rapid course. Since the days of the Incas, too, their waters have been controlled by irrigation works for the cultivation of crops. These irrigated valleys raise most of the **cotton** and **sugar cane**, which between them form more than a quarter of the exports of Peru. From about the Gulf of Guayaquil northward the coastal plain lies within the Equatorial Region, and has, therefore, heavy rainfall throughout the year. This change in climate makes possible the cultivation of **cacao**, the principal export of Ecuador.

It is, however, in the production of minerals that the region of the Northern and Central Cordillera is most important in the world's trade. A belt rich in copper ores runs along the western slopes of the Andes from Cerro de Pasco in Peru to south of the latitude of Valparaiso. Chile is, after the United States, the world's largest producer of **copper**. Similarly, Bolivia stands next to the Straits Settlements in production of **tin**, being responsible for one quarter of the world's supply. Silver, gold, and other minerals are also mined in the Andes. Some of the copper workings are in very inaccessible parts of the Andes—for

instance, the mines of the Cerro de Pasco Corporation in Peru are at an altitude of 15,000 feet. Development of mineral resources has thus required the construction of aerial ropeways and expensive railways to take the place of the slow-moving, heavily-laden llamas, and in mines and railways much foreign capital has been invested.

Chile's most important article of export is **nitrate**, which is an important fertiliser in agriculture and the source of supply of iodine. The nitrate beds extend for 450 miles north and south in the Atacama desert ; and the nitrate is shipped from a string of harbours along the coast, from north of Iquique to south of Antofagasta. To-day, however, the trade in Chilean nitrate is not so important as it was, because of the manufacture of " artificial " nitrate, extracted from the nitrogen in the air. At the northern end of the Andes (between the Sierra de Perija and the Cordillera de Merida) there are valuable deposits of **petroleum** round Lake Maracaibo, which make Venezuela the third largest source of the world's supply. An important oil-field extends from Peru into Ecuador ; and another oilfield occurs in Colombia east of the Magdalena River.

EXERCISES III

A

1. On a blank map insert these names : Buenos Aires, Rosario, Montevideo, Valparaiso, Lima, Fray Bentos, Santiago, Bahia Blanca, Callao, Antofagasta, Iquique, Caracas, La Paz.
2. Explain what is meant by : gaucho, alfalfa, estancia, chiqua, llama, Inca.
3. What are the chief minerals of the Andes ? What handicaps have to be overcome in mining and transport ?
4. Make a list of the chief exports of (a) Argentina, (b) Chile, (c) Peru.

B

1. Write a note on the nationalities of South America. How far do the Andes form a barrier between different states ? What other barriers exist ? What is meant by " Pan-America " ?
2. Compare Argentina with Chile in respect of (a) relief, (b) climate, (c) products, accounting for the differences in each case.

THE AMAZON AND ORINOCO LOWLANDS AND THE GUIANA PLATEAU : BRAZIL, VENEZUELA, BRITISH GUIANA

These three vast regions contain only about 6,000,000 inhabitants, because they are dominated by a tropical climate. The variation between day and night temperatures, for example, in the upper Amazon basin, may be as great as from 130° to 76° F. The atmosphere is always full of moisture, so that the jungle is like a Turkish bath by day, while in comparison the night seems bitterly cold. Such conditions, even though in other parts they are less extreme, make it impossible that those regions should become the homes of energetic peoples. Belem (Pará) on the delta of the Amazon, and Manaos on its tributary, the Rio Negro, are the largest towns.

In the early years of the twentieth century the Amazon Lowland supplied the world with **rubber**, from trees which grow wild in its tropical forests. As the trees that were more accessible to river transport were felled, "wild" rubber became unable to compete in the world market with cultivated rubber from the East Indies, although a small quantity is still exported. **Balata**, a species of gutta-percha also obtained by tapping the tree for latex, is a product of the Orinoco forests and of British Guiana. On the northern coastal plain **sugar cane** is grown as the leading export crop of British Guiana ; cacao and sugar are cultivated on the island of Trinidad. Gold is obtained from the river gravels in the northern part of the Guiana Plateau, and **petroleum** from Trinidad.

THE BRAZILIAN PLATEAU

The Plateau divides naturally into two sub-regions : (a) the Eastern Plateau and Coastal Plain ; (b) the Interior Plateau and Lowlands.

(a) **The Eastern Plateau and Coastal Plain** make up only about one-quarter of Brazil, but they contain four-fifths of the total population (about 32,000,000). North of

20° S. only the plain and the edge of the Plateau receive sufficient rain to enable agriculture to be carried on. As the climate is hot, the crops grown are sugar, cacao, cotton, and tobacco. The coastal plain in the north-eastern angle of Brazil, with Recife, or Pernambuco (pop. 340,000), as its port, is the principal **sugar** district, inland from which, on the hot, drier uplands, is the **cotton** belt. From the coastal plain south of Bahia, or São Salvador (329,000), comes almost all Brazil's **cacao**, in the production of which that country is second to the Gold Coast. Tobacco and sugar are also produced in this area.

South of 20° S. the edge of the Plateau, known as the Serra do Mar, rises steeply above the narrow coastal plain. Inland the Plateau averages a height of 3000 feet in the north, 2000 feet in the south. To this part of Brazil have come numbers of immigrants from Southern Europe, so that the white population is probably more numerous than the coloured. Here are the second

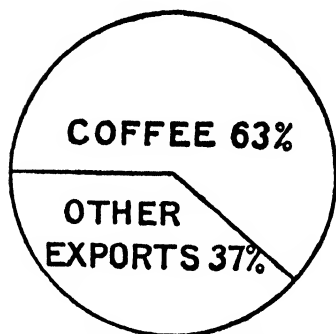


FIG. 20.—Exports of Brazil.

and third largest cities in South America—**Rio de Janeiro** (pop. 1,486,000), the Brazilian capital, on the broad Bay of Guanabara at the foot of the Serra do Mar, and **São Paulo** (879,000), which has textile factories with machinery driven by hydro-electric power, and is the centre of the great **coffee** industry, which supplies about two-thirds of the world's coffee crop. This district possesses advantages which allow of its producing and marketing coffee more cheaply than any of its competitors. A large area of specially suitable soil chances to be available just where there are also ideal conditions of relief and climate—well-drained hillsides high enough above the valleys to be free from the danger of night frosts, a hot and wet season for growth, and a dry, sunny winter for harvest and drying the beans. To these advantages has been

added a network of railways, which carry the coffee to the shipping-ports of Santos and Rio de Janeiro.

The state of Minas Geraes contains great deposits of iron ore, as yet little developed, for Brazil contains no coking coal, which is necessary for iron-smelting. In this state is also found manganese, the principal mineral export of Brazil.

(b) From its eastern edge the Plateau slopes gently westward to the **Interior Plateau and Lowlands**. Because of winter drought the vegetation is mainly Savanna ; and the chief use made of this area is to pasture cattle, so that it supports only about 1,000,000 inhabitants. The cattle herds are large, but the beasts of a poor quality, bony and difficult to fatten ; and they serve only to produce hides and jerked beef. The **yerba maté** tree grows in the forests of the middle Paraná basin. Yerba maté tea is the favourite drink of South America south of the 25th parallel of latitude, as coffee is farther north.

EXERCISES IV

A

1. Insert these names in your maps : Rio de Janeiro, Belem, Georgetown, Bogotá, São Paulo, Guayaquil, Manaus, Recife, Asunción.
2. On your map indicate those districts noted for : rubber, cacao, sugar, maize, coffee, oil, copper, silver, nitrate, wool, frozen beef, bananas, cotton, tin.
3. Coffee and wheat are the leading agricultural exports of South America. Where are they grown, and what conditions favour their production ?
4. Which states of South America lie north of the Equator line ? What are their chief products (a) agricultural, (b) mineral ?

B

1. Into what three regions may Brazil be divided ? (p. 89). Opposite each name (a) indicate variations in climate, and (b) mention typical productions.
2. What main causes delay development of the timber industry in the tropical forests ?
3. Contrast the Amazon Lowland with the Plate Lowland in respect of (a) position, (b) climate, (c) products, (d) population.

COMMUNICATIONS IN SOUTH AMERICA

The development of the interior of the continent has been hindered by the mountains on account of their nearness to the sea and their steepness of ascent, of the absence of rain on the west, and of dense tropical jungle on the east. The Amazon, Paraguay-Paraná, and Orinoco are navigable far inland, but are widely fringed by tropical forest ; and the Magdalena in Colombia, though it connects the Bogotá Plateau to the coast, can do so only by the help of two linking-up sections of railway.

The Inca empire in Peru had paved roads between Cuzco, the capital, and the isolated plateau basins under its rule. Elsewhere communication was either by water, or by tracks through the forest or across the mountains. The Spaniards and Portuguese introduced mules and, in the south, horses ; and pack-animals are still the only method of land transport over much of South America. The introduction of the motor-car brought about the first attempts to lay out serviceable roads since the days of the Incas. But in the wet tropical parts they are costly to build and maintain ; on the dry western coast the surface is soft and sandy ; on the Cordillera the gradients are steep ; on the Pampa there is no road-building material.

Two trans-continental railways cross the Andes from Argentina to Chile, and a fairly close network of lines on the Argentine Pampa centres on Buenos Aires. Lesser networks occur round Rio de Janeiro and São Paulo in Brazil. But elsewhere the railways mostly stretch inwards like tentacles from the coast, to exchange raw materials from the interior for factory goods imported from overseas. The lack of railways, especially in the Cordillera, has been a cause of the development of airways, following in general the line of navigable rivers, save where they have to diverge from them to make short crossings of the Andes.

Regular steamship services connect New York and London with Rio de Janeiro in about 15 days, and with Buenos Aires in about 20 days. The Panama Canal gives

SOUTH AMERICAN STATISTICS

Country.	Pop. ooo omitted.	Occupations.	Exports.	Chief Cities.	Pop. ooo omitted.
Argentina	11,441	Agriculture, ranching, meat refrigeration, flour milling.	Wheat, maize, refrigerated meat, linseed, wool, butter.	Buenos Aires. Rosario. Córdoba.	2,148 480 253
Bolivia .	2,911	Agriculture, mining.	Tin, silver, copper, lead.	La Paz.	146
Brazil .	40,272	Agriculture, ranching, rubber production, mining, textile industries.	Coffee, refrigerated meat, yerba maté, cocoa, cotton, hides.	Rio de Janeiro. São Paulo. Recife.	1,468 879 340
Chile .	4,287	Mining, agriculture, sheep farming.	Nitrate of soda, copper wool, iron ore, iodine.	Santiago. Valparaiso.	696 193
Colombia	7,851	Agriculture on small scale, mining, petroleum production.	Coffee, petroleum, gold, bananas.	Bogotá. Barranquilla.	235 139
Ecuador .	2,500	Tropical agriculture, petroleum production, mining.	Cocoa, petroleum, coffee, gold, Panama hats.	Quito. Guayaquil.	91 120
Guiana, British	312	Cultivation of sugar and rice, mining.	Sugar, diamonds, rice, balata.	Georgetown.	57
Guiana, Dutch	153	Agriculture.	Sugar, coffee, rum.	Paramaribo.	47
Guiana, French	47	Mining, timber felling.	Cocoa, gold, timber.	Cayenne.	13
Paraguay	851	Ranching, agriculture, timber felling.	Cattle products, yerba maté.	Asunción.	90
Peru .	4,500	Agriculture, sheep farming, mining, petroleum production.	Petroleum, copper, cotton, sugar.	Lima. Callao.	265 77
Uruguay	1,903	Ranching.	Sheep and cattle and their products.	Montevideo.	481
Venezuela	3,216	Agriculture, cattle ranching, petroleum production.	Petroleum, coffee.	Caracas. Maracaibo.	135 74

New York an advantage of 10 days shorter voyage than that from London to ports, such as Valparaiso, on the west coast.

SOUTH AMERICAN TRADE

Two foreign countries share nearly half the trade of South America. The United States supplies more than one-quarter of all the imports into South America, and takes more than one-quarter of the exports, while the British share of each is a little over one-fifth. Great Britain, however, because of her greater need of tin, cotton, and meat, takes the larger share of the exports of Bolivia, Peru, and the countries of the River Plate. She also supplies the greater share of the imports of the Plate area.

We come, therefore, to the conclusion that, from the economic point of view, the most important part of South America lies south of 20° S. latitude—that part which includes the Plate Lowland, the Central Valley of Chile, and the southern section of the Eastern Plateau of Brazil. Two-thirds of the export trade of South America is made up of the produce of the farms and ranches in this part of the continent, which holds nearly all the European population and most of the railway mileage, and lies everywhere within a distance of less than 400 miles from cheap ocean transport.

EXERCISES V

A

1. Explain these terms : sertãos, yerba maté, quebracho, cinchona, guano.
2. Why do only two lines of railway cross the continent in South America, compared with the many lines in North America ?
3. Why is there not an export of refrigerated meat from the Savannas of the tropical regions ?
4. Why are the capitals of the east coast countries seaports, and those of all the west coast countries inland cities ? Give examples.
5. (a) How is the trade of Bolivia handicapped ?
(b) What languages are spoken by the majority of people in South America ?
(c) What are the chief imports into South America from Great Britain ?

B

1. Why were Colombia, Peru, and Bolivia the pioneer countries in the development of airways in South America ? Why does the air and sea mail route between Toulouse and Buenos Aires take $7\frac{1}{2}$ days while the return journey takes 9 days ?
2. (a) Why do more people live on the Highlands than on the Lowlands of South America ? (b) What advantage does the Plate Lowland have compared with highland areas of South America ?

CHAPTER V
NORTH AMERICA :
THE CONTINENT OF “ ABUNDANT LAND ”

HIGHLANDS AND LOWLANDS

NORTH AMERICA, like South America, is triangular in shape. It consists of two ancient plateaus—the **Laurentian Plateau** and the **Appalachian Highland**—in the east, a system of folded mountains—the **Cordillera**—in the west, and a huge **Interior Plain** stretching from north to south. This Plain is drained by three great rivers—the **Mackenzie**, the **St. Lawrence**, and the **Missouri-Mississippi-Ohio**. In area North America is about one-seventh larger than South America. Canada, its largest state, has nearly the area of Europe, and forms almost one-third of the British Empire. The area of the United States is slightly less.

(a) **The Laurentian Plateau.** This region of very hard rocks is the oldest part of North America. Because it is shaped like the triangular shield of a mediæval knight, it is sometimes called the **Canadian Shield**. As the plateau is immensely ancient, it has been planed down by wind and water until most of it is now less than 2000 feet above sea-level. In addition to this planing down by erosion a former coast-line has sunk below sea-level, so that the ocean has flooded part of the Shield, and thus formed **Hudson Bay**.

At one period in the past the Canadian Shield and other parts of North America were covered by ice, as Antarctica is to-day. Glaciers scoured off the soil that had been formed from the rocks of the Shield, carried it southward, and laid it down between the Missouri and Ohio on the

Great Interior Plain. The Shield was thus left as a hummocky region of bare rock, almost useless for agriculture except in the Clay Belt, the bed of an old lake on the southern shore of Hudson Bay (Fig. 21). The ice-sheet also scooped out hollows in the rock and dammed up water behind its moraines, forming innumerable lakes. A canoe can be carried from one to another of the streams that issue from these lakes, so that travel is possible in any

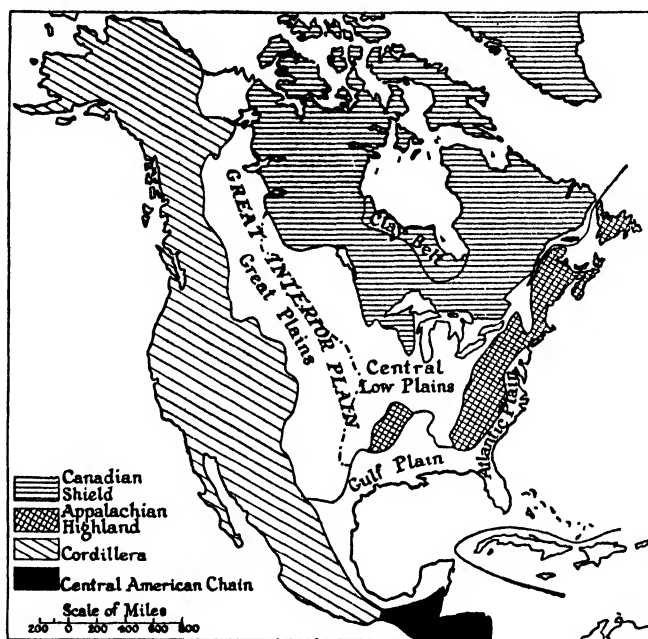


FIG. 21.—North America : Structure.

direction. On the other hand, the country is so unfavourable for road-making that no motor road has yet been constructed between Winnipeg and Ottawa or Toronto across the bare rock and water net-work of the Shield.

(b) **The Appalachian Highland.** This region stretches south-west for 2000 miles from Newfoundland to Alabama. The **Ozark Plateau** west of the Mississippi is probably an outlying section of the Appalachians. It is divided into two sections by the **Hudson-Champlain Gap** between New York and Montreal.

(1) The northern section includes Newfoundland, the Maritime Provinces of Canada, and the New England States. These are lands, hilly and rugged in the interior, upon which the ice-sheet has left in the main thin, poor, boulder-strewn soil. More fertile soil is found along the rivers and in patches near the coasts. The sinking of the coast-line has brought the sea up former river valleys, thus creating harbours, and widened the continental shelf which provides feeding-grounds for fish.

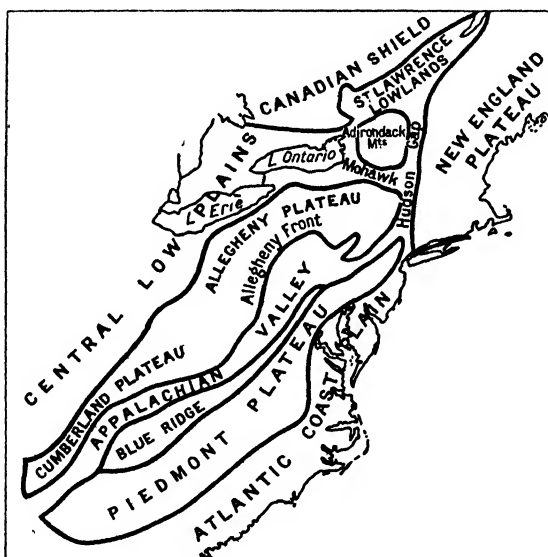


FIG. 22.—The Appalachian Highland.

(2) The southern section consists of two plateaus: on the west the **Alleghenies** (Allegheny and Cumberland Plateaus), on the east the **Piedmont Plateau**, with the fertile **Appalachian Valley** between. The Alleghenies drop rapidly towards the Interior Plain, but the Piedmont Plateau has a gentle seaward slope to the **Fall Line** where waterfalls or swift reaches on the rivers mark the drop from the Plateau to the **Atlantic Coast Plain**. At its northern end the Appalachian Valley becomes the Hudson-Champlain Gap, which connects with the **Mohawk Gap**. These two

Gaps are the lowest and most important passes through the eastern highlands.

South of Chesapeake Bay the old ocean floor has been raised up, and part of it has been added to the land. Instead, therefore, of "drowned" river valleys forming inlets and harbours, there is a coast-line fringed with sandy reefs, from which the broad Atlantic Coast Plain stretches inland, at its widest 200 miles across, to the Fall Line. As the falls on rivers flowing seaward from the Piedmont supplied water power for the early development of industry, a string of settlements came into being along the Fall Line. The importance of some of these—Philadelphia, Baltimore, Washington—has been increased by their position on the "drowned valleys" of Delaware and Chesapeake Bays, which provide access for ocean-going vessels.

(c) **The Cordillera.** The Cordillera at its greatest breadth along parallel 40° N. is 1000 miles across as compared with the 300 miles across the Appalachian Highland, and it rises in many peaks (such as Mt. Robson, Pikes Peak, and Mt. Logan) to 14,000 and even to 20,000 feet—heights two and three times as great as the loftiest summit of the Appalachians. The whole mountain system contains three main belts, roughly parallel to each other and to the Pacific coast of North America.

(1) The western belt is a double chain of **Pacific Mountains** separated by a **Central Valley**, instead of a single Coast Range as in South America. The outer chain (Lower California—Coast Ranges of California and Oregon—Vancouver Island—Princess Charlotte Islands) is lower and less continuous than the inner chain (Western Sierra Madre, Sierra Nevada, Cascade Range, Coast Range of British Columbia, Alaskan Range, Alaskan Peninsula). The Central Valley (Gulf of California—Valley of California—Willamette Valley—Puget Sound—Strait of Georgia) is in parts submerged by the ocean. The ocean ports of San Francisco, Portland, Seattle, and Vancouver have been established in the "drowned valleys" of San Francisco Bay and Juan de Fuca Strait and in the valley of

the Columbia river, which cut right through the outer mountain chain.

(2) The eastern belt commences in Mexico as the Eastern **Sierra Madre**, and continues northward beyond the Rio Grande as the bare and lofty ranges of the **Rocky Mountains**. These ranges are the main water-parting of the continent, and the head-streams of the rivers which drain eastward to the Missouri, the Mackenzie, and Hudson Bay rise at no great distance from the head-streams of tributaries of the Colorado, the Columbia, and the Fraser rivers, which flow westward to the Pacific. The whole mountain system is divided about 42° N. into Northern and Southern Rockies by the broad, generally flat Wyoming Basin, which has a gradual approach from the east, while South Pass, the easiest crossing of the whole divide between Atlantic and Pacific drainage, lies just westward. These factors decided the routes followed by the early Trans-Rocky Trails, and made possible the construction of trans-continental railways.

(3) Between the Sierra Madre-Rockies and the coastal ranges are enclosed huge plateaus, all of which stand at a considerable height above the sea.

- (i) Between the two Sierra Madre ranges the **Mexican Plateau** rises to 6000 and 8000 feet ;
- (ii) West of the Southern Rockies the Colorado River and its tributaries flow to the Gulf of California diagonally across the **Colorado Plateau**, into which they have sunk their beds in deep canyons, the famous Grand Canyon being 200 miles long ;
- (iii) Between the Colorado Plateau and the Sierra Nevada-Cascade Mountains the **Great Basin** is an area of internal drainage, where an atmosphere like a dry sponge absorbs all moisture, and intense evaporation has caused the water of the Great Salt Lake to become saturated with mineral salts ;
- (iv) The **Columbia Plateau** between the Cascades

and the Northern Rockies is built of layers of lava, which have weathered into deep, fertile soil.

(d) **The Great Interior Plain.** This vast central lowland is drained northward to the Arctic Ocean by the Mackenzie, which, with its tributary the Peace River, has a length of 2350 miles, southward to the Gulf of Mexico by the Mississippi, which, in conjunction with the Missouri, is the longest river in the world (4220 miles), and north-eastward by the St. Lawrence, which carries the overflow from the Great Lakes. As the Interior Plain as far south as the Missouri and the Ohio was over-ridden by the ice-sheet, the smoothing action of the glaciers has left indefinite the water-parting between streams belonging to the Mississippi River system and those which flow to the Great Lakes. A short "portage" overland enabled the Indians to carry their birch-bark canoes from one drainage system to the other. The absence of any natural boundary also led to the frontier between Canada and the United States west of Lake of the Woods being drawn along a parallel of latitude. The Interior Plain has three main divisions :

(1) The **Great Plains** are the rain shadow of the Rocky Mountains, so that in most of the United States the rainfall they receive is not enough for agriculture. In the south of the Canadian provinces of Alberta and Saskatchewan they became farming land, because the cooler climate does not cause such great evaporation, and sufficient moisture is kept by the soil.

(2) The **Central Low Plains**, or **Prairies**, receive more than 20 inches annual rainfall, except in Canada. As far south as the Missouri and Ohio there is wonderful farming land on the smooth, deep, and rich soils laid down by the ice-sheet. Farther south there are very fertile soils in the Lexington district of Kentucky and the Nashville district of Tennessee. Between the Canadian Shield and the Appalachian Highland the Low Plains stretch a finger north-eastward to Quebec as the **St. Lawrence Lowlands** (Fig. 22).

(3) **The Gulf Plain** extends from the Gulf of Mexico up the Mississippi to St. Louis. It has been built up by soil carried down by the great river, and thus has level surfaces, and is fertile farming land.

(e) **The Central American Chain and the West Indies.**—The Central American Chain stretches from north-west Colombia in South America to the Isthmus of Tehuantepec, and with the thousands of islands in the West Indies shuts in the “American Mediterranean”—the Caribbean Sea. The sea passage west of the Virgins divides the West Indies into two groups—the Greater Antilles to westward, and the Lesser Antilles to eastward. The latter, with the exception of Barbados and Trinidad, are the peaks of a string of old volcanoes. Farther north the Bahamas are the top of a broad platform of coral.

EXERCISES I

A

- Find these names on the map of North America :
Tropic of Cancer, Arctic Circle, Gulf of Mexico, Gulf of California, Hudson Bay, Baffin Bay, Isthmus of Tehuantepec, Caribbean Sea, Queen Charlotte Islands.
- On a blank map show the position of these ranges and passes :
Western and Eastern Sierra Madre, Cascade Range, Coast Range, Rockies, Alleghenies, Laurentian Highlands, Ozark Plateau, Mt. Robson, Mt. Logan ; Kicking Horse, Crow's Nest, Yellowstone Passes.
- Trace the courses of these rivers on your map and insert the names of these lakes : Mackenzie-Peace, St. Lawrence, Mississippi-Missouri - Ohio - Arkansas, Hudson - Mohawk, Columbia, Colorado ; Lakes : Great Bear, Great Slave, Athabasca, Winnipeg, Champlain, Great Salt, and the five Great Lakes.
- Give examples of : (a) a hummocky region of bare rock ; (b) thin poor boulder-strewn soil ; (c) sandy reef-fringed coast-line ; (d) an area of inland drainage ; (e) a drowned valley.

B

- Explain and exemplify : erosion, moraine, continental shelf, canyon, portage.
- Explain why so many lakes have been formed in North America.

3. Where are the most suitable points for crossing (*a*) the Appalachian Mountains, (*b*) the Rockies? What have been the results of the discovery of these points?
4. Draw a sketch to show a cross-section of North America taken on latitude 40° N.

CLIMATE

In contrast with South America, the North American triangle lies mainly in the Temperate Zone. In January the Aleutian and Icelandic areas of Low Pressure (p. 18) extend, the one eastward over British Columbia and the other westward over the St. Lawrence estuary (Fig. 23),

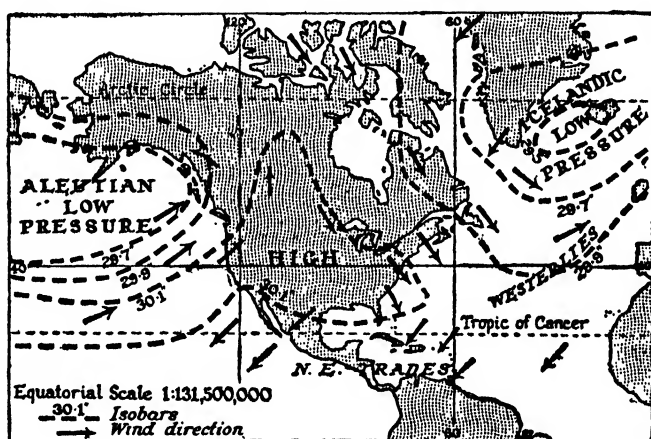


FIG. 23.—North America : Pressure and Winds—January.

producing south-westerly winds on the north Pacific coast and north-westerly winds on the Atlantic coast. The **Pacific coast** is therefore **warmer** than both the interior and the Atlantic coast. It has to be remembered, however, that there is no east-west mountain barrier across the Interior Plain to prevent now a wave of cold air from the Arctic Circle flowing far southward over the continent, now a warm wave from the Gulf of Mexico flowing northward.

In July the land is warmer than the sea, and the centre of the continent is covered by a trough of low pressure, which separates areas of high pressure centred over the

Atlantic and Pacific Oceans (Fig. 24). On-shore winds keep the **Pacific coast** as far south as California much

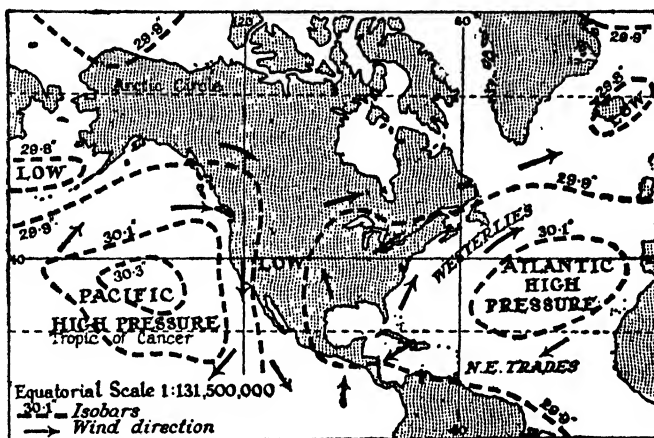


FIG. 24.—North America : Pressure and Winds—July.

cooler than the land, so that the isotherms now arch northward (Fig. 25). The hottest part of the continent is an area in north-west Mexico and the south-west United States.

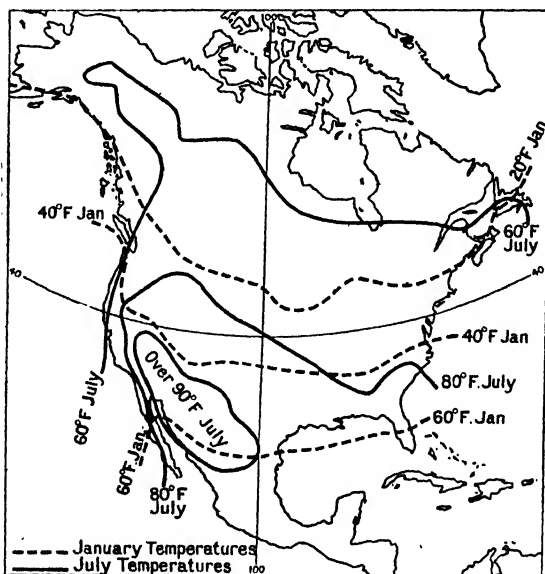


FIG. 25.—North America : Temperature.

North of about latitude 42° North America lies in the belt of the Westerlies ; between 42° and 34° the Westerlies blow in winter and the Trade Winds in summer ; between 34° and 25° the North-East Trades blow throughout the year. South of the Tropic of Cancer the Mexican Plateau, Central America, and the West Indies fall within the belt of the Trades in winter, and in summer within that of the

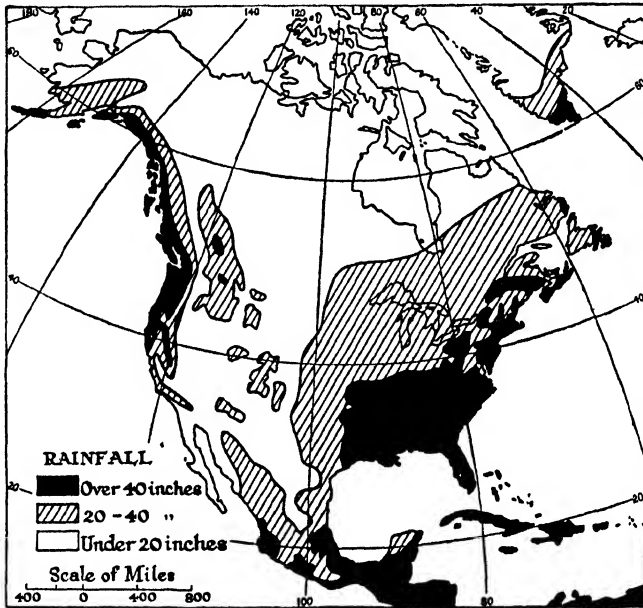


FIG. 26.—North America : Annual Rainfall.

Doldrums when the sun appears to move north of the Equator.

In the Westerly Wind belt the moisture-laden air meets the triple barrier of the Cordillera, and, rising to cross it, deposits very heavy orographical rain on the windward slopes of these ranges, while the Central Valley and the Plateaus are rain shadows. In addition to the general eastward movement of air currents, " families " of cyclones cross the continent towards the estuary of the St. Lawrence. During their passage they attract moisture-laden air from the water areas of the Atlantic, the Gulf of Mexico, Hudson

Bay, and the Great Lakes, and are thus enabled, everywhere **east of 100° W. longitude**, to supply **sufficient moisture for the growth of crops**. This cyclonic rainfall increases in amount from north to south, while the height of the Appalachians secures a heavy fall of orographical rain.

Between 42° and 25° N. the Mexican Gulf area benefits from the summer cyclones, but the Cordillera as far south as 34° has winter rain and summer drought. Southward to latitude 25° the Pacific coast is within the belt of the Trade Winds, which are dry in this area, so that desert lies inland from the coast.

Most of Mexico, Central America, and the West Indies receive convectional rain in summer from the ascending air currents that accompany the northward movement of the Doldrums. In winter their mountainous windward slopes obtain orographical rain from the Trades. These warm but refreshing breezes bring different climates to the leeward and windward slopes of the West Indian islands—on the west scanty, uncertain rainfall, on the east super-abundant moisture that creates forest and dripping jungle. The islands are sometimes swept by tropical cyclones, called hurricanes, that smash down plantations, and destroy ships and buildings.

NATURAL VEGETATION AND THE USE OF LAND

Temperature and Rainfall determine the distribution of natural vegetation. On the two Mexican Sierras and the Mexican coast of the Gulf, in Central America, and in the West Indies, tropical heat and moisture produce **Tropical Forest**. The height of the Pacific mountains as far south as the Sierra Nevada, of the Rockies, and of the Appalachians secures a rainfall that clothes their slopes in **Temperate Forest**, while a broad belt of (mainly coniferous) Temperate Forest crosses the continent north of the Great Lakes from the Rockies to the Maritime Provinces. Poleward this forest thins out in birches and brushwood to the limit of tree-growth, where the brushwood gives

place to the **Tundra** of the Arctic Prairies. Much of the Central Low Plains and the Gulf Plain were also originally under timber, which has been largely cleared, partly by Indian fires, partly for cultivation. On the other hand, scanty rainfall has always kept the Great Plains as **Temperate Grassland**, treeless except along the rivers or on the higher hills. The vegetation of the Cordilleran



FIG. 27.—North America : Use of Land.

plateaus is likewise grassland, but much of it is a very poor type, sage bush and bunch grass.

North and Central America are thus divisible in five natural regions (Fig. 27) :

- (1) Tundra and Birch-Larch Forest Region ;
- (2) Eastern Agricultural Region ;
- (3) Western Grazing and Irrigated Crops Region ;
- (4) Pacific Coast Region ;
- (5) Tropical Region.

When we compare the distribution of the population of North America (Fig. 10) with the distribution of its Highlands and Lowlands, we do not find, as we did in the case of South America, that the greater part of the population lives in highland regions. What we do find is that, speaking broadly, **people are closely settled east of 100° longitude and south of 50° latitude**, while west of 100° and north of 50° settlement is sparse. When we compare this distribution with Fig. 27, it is clear that the areas of close settlement are the Eastern Agricultural and the Tropical Regions. Of these, the Eastern Agricultural Region is that part of North America which lies nearest to Europe. The whole history of the settlement of the continent came to turn upon this nearness to Europe of abundant good land, where men might make new homes.

EXERCISES II

A

1. On a blank map write in these words in appropriate positions : Tropical forest, tundra, winter rain vegetation, temperate forest, semi-desert. Shade those areas with heavy rainfall.
2. Explain how the areas shaded in Question 1 have heavy rainfall.
3. What is meant by (a) a maritime climate, (b) a continental climate, (c) a Mediterranean climate. Refer to districts as examples.

B

1. Which areas in North America are affected by : westerlies, cyclones, north-east trade winds, hurricanes ?
2. The temperature of three towns is as follows :

	January.	July.
Vancouver . . .	35° F.	60° F.
Winnipeg . . .	-3° F.	66° F.
Halifax . . .	25° F.	64° F.

Account for the differences.

3. Give one example of each of the following in the United States :
 - (a) Places very cold in winter and very hot in summer.
 - (b) Places with most rain in winter.
 - (c) Places with heavy rain all the year round.
 - (d) Places with little rain at any season.

THE SPANIARDS IN TROPICAL AMERICA

Columbus in 1492 believed that he had reached the East Indies, and called the inhabitants Indians. The leading Indian state was the Aztec empire, which had succeeded an even earlier civilisation that had reached a high standard of agriculture. The Aztecs lived in great stone cities, and were rich in copper, silver, and gold. This magnet of the precious metals attracted the Spaniards to the tropical lands and islands. They lived as a ruling class, while the Indians, and later negro slaves brought from Africa, worked in the mines and on sugar plantations. Although the Spaniards pushed northwards up the Pacific coast to California, establishing ranches and mission stations, there never was any real Spanish settlement such as was made by other European nations in Canada and the United States.

THE FRENCH AND ENGLISH IN TEMPERATE AMERICA

Like Columbus, all the early explorers sought a route to eastern Asia ; and the great size of North American waterways deluded sailor after sailor into believing that in this or that bay or estuary he had found the object of his search. Many a ship was lost before men realised that the Northwest Passage to Asia was closed to navigation by ice. But if their search failed in its immediate purpose, it brought about European settlement of temperate America, to which the French and the English were brought by the fact that they naturally made the Atlantic crossing farther north in the Trade Wind belt than the Spaniards. In the lands reached they had the chance to make real homes.

Cabot's discovery of Newfoundland, though its harsh climate and wild coasts for nearly a hundred years discouraged permanent colonisation, led to immediate use of its rich fishing-grounds. Cartier's and Champlain's voyages up the St. Lawrence showed the French the value of the fur trade, and resulted in their settlement in Canada. On the St. Lawrence Lowlands the strips of land farmed by the

“Habitants” or cultivators, faced the great river that formed their only highway. To make certain of a steady supply of furs, upon which the colony depended, the French adopted the birch-bark canoe, the method of travel of the Indians, in whose hands was the fur trade. This led them far afield over the Canadian Shield, down the Mississippi to New Orleans, and westwards almost to the Rockies, thus scattering their scanty population. They also became allies of the local Indians against the powerful league of the Iroquois. The “Long House” of the Iroquois was the Mohawk Gap, through which many beaver pelts were sent to the English at New York; and after 1670 the English Hudson Bay Company also began to export by Hudson Strait furs taken in their territory of Rupert’s Land round Hudson Bay.

The English settlement in North America was not made to obtain furs, but was the result of emigration to found new homes. The New England colonists, with good harbours, fishing-grounds, and forested highlands as their readiest resources, became fishermen, shipbuilders, and traders. On the Atlantic Coast Plain the Virginians, with better soil and climate, became farmers, raising grain, tobacco, cotton, and rice. The two groups were linked together when the fur-trading centre on the site of New York was acquired from the Dutch in 1664. The Appalachian Highland, clothed with forest and snow-clad in winter, was a barrier which prevented such a rapid westward spread of the population as occurred with the French in Canada; and at the same time it gave protection against the Indians. By the middle of the eighteenth century there were ten British colonists in North America to every Frenchman. The issue lay between fur traders and farmers. The British fleet prevented help reaching Canada from France, so the farmers had only to unite for Canada to fall into British hands.

Your history book tells you how, when the danger to the colonists from the French was removed, they quarrelled with the Government in Britain; and how, after a long

struggle, they secured their independence, and formed a Union known as the United States of North America (U.S.A.). Those colonists who remained true to Britain, the United Empire Loyalists, moved northward into Canada, and settled to the east of the French in the Maritime Provinces, and to the west of the French in Ontario.

THE UNITED STATES OF AMERICA

These States were originally situated on the Atlantic coast, hemmed in by Canada on the north and Mexico on the south, so that expansion had to be westwards across the continent in a belt of temperate climate, well suited to Europeans. The Appalachian barrier had been passed before Independence was won, by following the river valleys to Pittsburgh on the Ohio, and by moving down the Appalachian Valley to the Cumberland Gap in the Alleghenies, discovered by Daniel Boone. The completion of the Erie Canal through the Mohawk Gap in 1825 brought the whole Interior Plain into direct communication with New York. Settlers next moved across the Mississippi into Louisiana and Texas; and then from Kansas, with packhorse and "prairie schooner," week after week they faced the deadly monotony of the sun-baked Great Plains. By two main trails they crossed the Rockies to the Pacific Coast districts of greater rainfall. By the Oregon Trail, four months' journey from Kansas to Fort Vancouver, they reached the valley of the Columbia; by the Santa Fé Trail they reached California. In 1869 the railroad joined New York and San Francisco. To-day there are six lines of railway linking the Atlantic to the Pacific Coast.

This expansion was not the work of descendants of the British colonists alone. Between 1820 and 1915, 30,000,000 immigrants landed in the United States. Till 1890 they were not very different from the original colonists. They came—Germans, English, Scots, Irish, and Scandinavians—from northern and western Europe to settle on the abundant land opened up by the railways. By 1900 most of the best

agricultural and grazing land had already been occupied ; and the immigrants, mainly from the south and east of Europe, did not become farmers, but factory workers and miners. The United States now discourages immigration from these parts of Europe. Of the total population—123,000,000—nearly one-tenth consists of negroes, descendants of the African slaves brought to the Southern States to work on the plantations of cotton, rice, indigo, and tobacco.

EXERCISES III

A

1. What traces are found to-day of (a) early French, (b) Spanish settlement in North America ?

B

1. What causes led to the settlement (a) of the Spaniards in the Caribbean region ; (b) of the French in the St. Lawrence region ; and (c) of the English on the Atlantic coast ? Discuss the advantages and the disadvantages of the three situations.
2. In holding the mouths of the St. Lawrence and the Mississippi the French controlled two of the three main gateways to the Interior Plain. What is the third gateway ? Why did the French not make better use of this advantage ?

THE UNITED STATES : AGRICULTURE

The most important climatic division is the narrow belt (rather than sharply marked line) west of which high temperature causes evaporation of so much of the scanty rainfall that too little moisture remains for agriculture to succeed without the help of irrigation. This belt divides the United States into an **Eastern Agricultural Region** and a **Western Region of Grazing and Irrigated Crops**. North of about 50° latitude, temperature (and with it evaporation) becomes low enough to leave moisture sufficient for farming ; and there is also an ample rainfall in the **Pacific Coast Region**, including an area round San Francisco Bay (Fig. 27).

(1) THE EASTERN AGRICULTURAL REGION

As this whole Region has sufficient rainfall for some form of agriculture, the crops grown in different areas are mainly decided by the decrease of temperature from south to north, the best land in each area being used for whatever crop gives the highest yield. In the low-lying country situated immediately inland from the coast of the Gulf of Mexico, and including Florida, there are, as a rule, no frosts between 1st March and 1st December. As this belt has also a heavy summer rainfall, the crops cultivated are, from

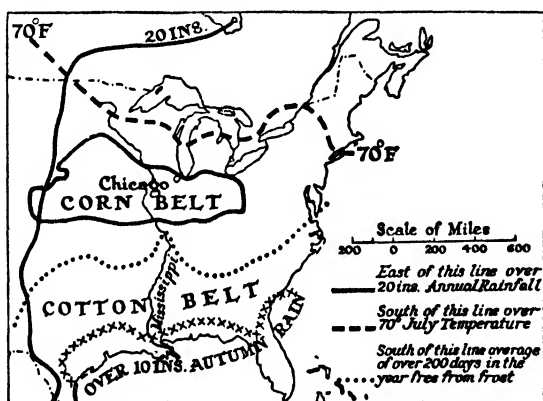


FIG. 28.—Corn and Cotton Belts.

west to east, **rice**, **sugar cane**, (in the Mississippi delta), **early vegetables**, and, in Florida, **citrus fruits**. The mild winter climate of Florida has given rise to a "tourist industry"; and the coral islands of the Florida Keys and the Bahamas are centres of the sponge fishery. North of this belt the Belts of Cotton, Tobacco and Winter Wheat, Corn (Maize), and Spring Wheat, follow in succession. Domesticated animals in this Region depend more on fodder crops than on grazing. There are more pigs but fewer sheep than in the Western Grazing Region, because the pig needs grain, while the sheep is satisfied with grass.

(a) **The Cotton Belt.** Owing to the nature of the cotton plant (p. 47), climate almost entirely determines the

bounds of this area (Fig. 28). Late spring frosts kill the young plants ; early autumn frosts damage the unpicked bolls ; too heavy rain in autumn interferes with the picking and damages the fibres. The " Cotton States " from Texas to North Carolina produce more than half the raw cotton in the world, which is shipped from New Orleans, Galveston, and Charleston.

(b) **The Corn Belt.** Some maize is grown practically everywhere in the Eastern Agricultural Region, but in

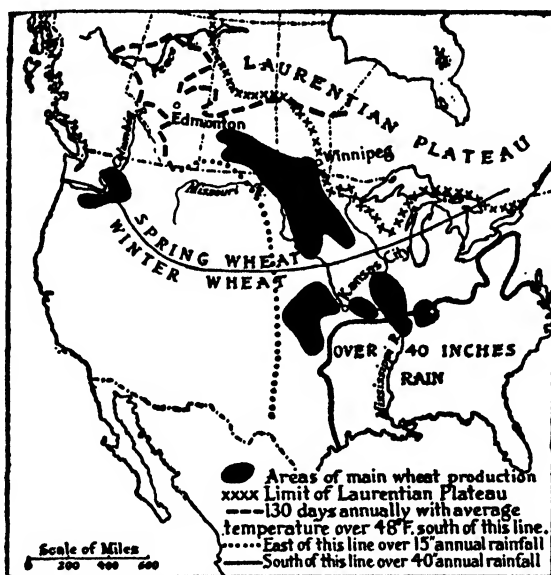


FIG. 29.—North America : Wheat Areas.

the Corn Belt (Fig. 28) it is the most productive crop. The grain raised round Chicago is for manufacture as starch, glucose, oil, and corn-meal ; but the real importance of the Belt lies in the enormous quantities of livestock which its maize and pastures feed (p. 34). The Corn Belt is the centre of production of beef, cattle, and pigs in the United States. Probably no other district of the same size in the world supplies so much food for animals and so much meat for man.

(c) **The Wheat Belts.** The Interior Plain of North

America, like the Plate Lowland, provides the wide level surfaces and unexhausted soils which make possible the production of wheat on a grand scale (p. 32). On the Great Plains west of about 96° longitude the low rainfall (20 to 16 inches) has not washed plant-foods from the ground, with the result that a belt of dark, exceptionally fertile soils (known as Black Earth soils) stretches—about 200 miles wide—from Texas to Edmonton in Canada. Over much of the eastern United States wheat is the main crop (Fig. 29); and the export trade is considerable from this area (Fig. 7). South of the Corn Belt the type of wheat is Winter Wheat; north-west of the Corn Belt it is Spring Wheat, the cultivation of which extends into the Prairie Provinces of Canada.

(d) **Other Products.** In the north-east of the Eastern Region, in an area stretching south of the Great Lakes to the Atlantic seaboard, the need of milk, vegetables, and fruit for huge city populations has made **dairying** and **market gardening** the chief types of farming, and brought many thousand acres under hay and pasture as winter and summer cattle food. East of the Winter Wheat Belt, where the rainfall becomes excessive for wheat (Fig. 29), nearly half the world's **tobacco** is raised on the Atlantic Coast Plain and the Piedmont, and in Kentucky and Tennessee.

(2) **THE WESTERN GRAZING AND IRRIGATED CROPS REGION**

This huge Region—2500 miles from north to south, 1000 miles from east to west—lies chiefly in the United States, though it extends south into Mexico, north into Canada. Here the rainfall in general is too scanty for cultivation, so the moister land pastures cattle, the drier land sheep. It contains more than a quarter of the cattle in the United States, and more than half the sheep. To obtain the greater amount of food which agriculture yields, thousands of reservoirs have been constructed to store water from the mountain streams, and many miles of ditches dug to bring the water to fields in the valleys, where alfalfa, wheat, and maize are grown. Yet even with all this labour,

to only a relatively very small part of this dry Region has **irrigation** water been supplied.

Along the western margin of the Great Plains and on the Columbia Plateau, where there are a slightly heavier rainfall and fine-grained soils that hold moisture, "**dry-land farming**" is practised—that is, the ground is ploughed deeply; its surface is kept pulverised to prevent evaporation; and crops, such as varieties of millet (p. 34), are selected because they are specially suited to dry climates. In the Columbia Plateau wheat, which by origin is a dry climate plant (p. 31), is the leading crop (Fig. 29).

(3) THE PACIFIC COAST REGION

This Region, like that of the Southern Cordillera in South America, lies partly within the constant Westerly Wind belt and partly within that of Winter Rain. In both districts there are fairly large town populations which provide, as in the east, markets for the produce of dairy farms, market gardens, and orchards. The wealth of the **Westerly Wind district** consists, however, mainly in the magnificent timber of its **coniferous forests**, where trees, such as the Douglas fir, commonly reach 250 feet in height. We have noted in Chapter II. (p. 46) the value of the **salmon fisheries** and the **canning industry** of this part of the Pacific Coast.

The **Winter Rain** area, on the other hand, is the most important **fruit and vegetable-producing** district in North America. There is a difference, also, between the fruits cultivated in the two areas, apples, plums, and small fruits, such as strawberries, being raised in the north, while the sunnier south grows grapes, plums, oranges, peaches, pears, and apricots. Most of the cultivated land in the Winter Rain area lies in the Valley of California, which is 400 miles long and 40 to 50 miles in width. The rainfall varies from 40 inches at the north end to less than 10 inches at the south end of the Valley, where it is necessary to make use of the heavy winter snowfall on the Sierra Nevada to supply water for irrigation. The Los Angeles district produces citrus fruits and early vegetables. The delightful

winter climate of California has made this state, like Winter Rain districts in other continents, an important **tourist centre**.

THE UNITED STATES : MINERALS AND POWER

When we sum up this agricultural and pastoral production, it is clear that in these respects the United States is very rich indeed, raising a large proportion of the world's most important crops (pp. 32, 35). In minerals the country is also richly endowed, with a tenth of the world's gold,

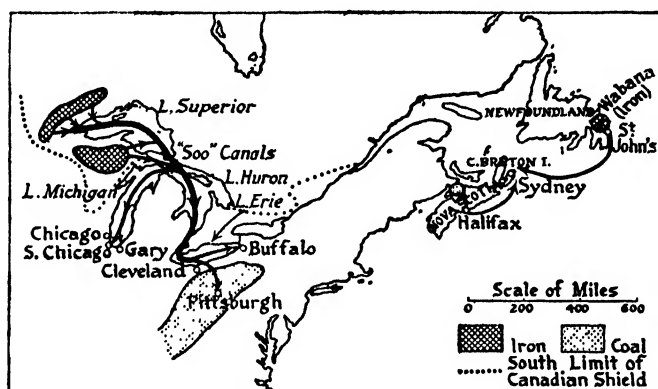


FIG. 30.—Water Transport and the Iron Industry.

two-tenths of its silver, three-tenths of its lead, zinc, and phosphates, four-tenths of its coal, iron, copper, and electricity developed largely from water power, six-tenths of its petroleum, and seven-tenths of its potash. The only metal almost entirely absent is tin.

(a) **Minerals of the Cordillera.** In the Cordillera, in United States territory, copper is mined chiefly in Arizona, at **Butte** (Montana), and in Utah; lead round **Cœur d'Alene** in the northern Rockies and in Utah; gold in the Californian Sierras and Colorado.

(b) **Minerals of the Canadian Shield.** The most important deposits of iron ore in the United States are found south and west of **Lake Superior**, where the Shield extends south of the Canadian frontier (Fig. 30).

(c) **Coal-fields.** Three-fourths of the coal mined in the United States comes from the **Appalachian coal-field** in the western belt of the Appalachian Highland. The richest part of this coal-field is in Pennsylvania; this area yields both bituminous coal and anthracite. The bituminous seams are horizontal and uniform in thickness, so that coal-cutting machinery can be used. They have also been cut into deeply by rivers, which means that the miner has not to travel far underground to reach the coal-face, and the coal has not to be transported far from the pit-head to boat or rail. Thanks to these advantages, the American miner cuts three times as much coal in a year as the British miner. One-sixth of the coal of the United States comes from the **Central coal-field** (Illinois, Indiana, Kentucky) in the Interior Plain.

(d) **Oil-fields.** We have noted (p. 56) the predominance in production of petroleum of countries bordering the Caribbean Sea; amongst these the United States is vastly the most important source of supply. In oil, as in coal, more than half the output comes from one area—the **Mid-Continental oil-field** west of the Ozark Plateau. Second in importance is the **Californian oil-field** on the western margin of the Cordillera. The other oil-fields have much smaller output.

(e) **Other Minerals of the Interior Plain and Appalachian Highland.** Besides coal and petroleum, the Interior Plain contains the most important lead mines in the United States in Missouri, zinc in Kansas and the upper Mississippi valley, and bauxite, the ore from which aluminium is obtained, in Arkansas. The richest deposits of phosphates are in Florida. In the Appalachian Highland iron ore is mined, notably near **Birmingham**, at the southern end of the Appalachian coal-field.

(f) **Water - Power.** The most favourable conditions for generating electrical energy from rivers (p. 55) are found in those districts which in the past were covered by glaciers, because the action of the ice has created lakes to serve as reservoirs. The United States' development

of electrical energy from water-power to the amount of 12,000,000 horse-power has taken place chiefly in glaciated regions—either in the northern Appalachian Highland or in the Cordillera.

THE UNITED STATES : INDUSTRY

With such magnificent natural resources, both agricultural and mineral, with power for industry available, and with an active, growing population, the United States is both a great agricultural and a great manufacturing country. Manufacturing, mining, transport, commerce,

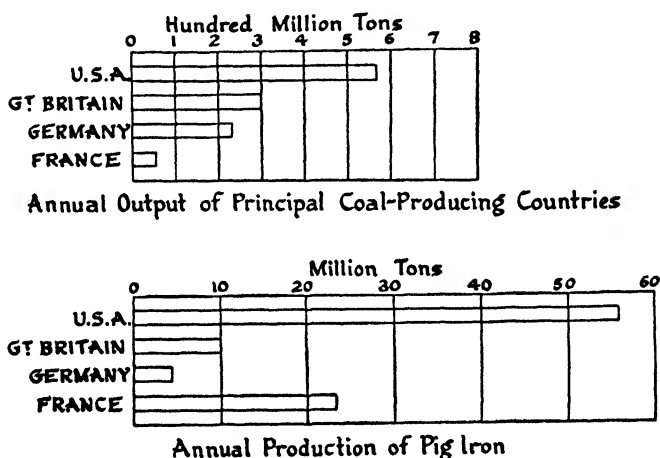


FIG. 31.—Production of Coal and Iron.

and professional occupations, such as medicine, now employ half its people. This development has been made possible by the possession of **cheap Transport**. The United States owns two-fifths of the world's railway mileage, while the Great Lakes provide the most important inland waterway in the world. The "Soo" canals, between Lakes Superior and Huron, carry annually nearly three times the tonnage which moves through the Suez Canal.

The six groups of industries in the United States which use the greatest amounts of power are those concerned in the manufacture of (1) iron and steel, (2) foods, (3) textiles, (4) forest products, (5) machinery, and (6) paper. To

a certain extent some of these industries are localised near the sources of supply of their raw materials. For example, fruit-canning is carried on in California ; there are now more cotton spindles in the southern Atlantic states than in New England ; and a centre of steel production is Birmingham (Alabama), where iron ore and limestone (to " flux " the iron) are available. Naturally, all such localities must also be able to obtain cheap power. The principal **manufacturing belt of the United States**, however, is the strip of country which lies between a line drawn from Milwaukee to Portland in Maine, and a second line drawn from St. Louis through Baltimore. Though this belt contains only about one-tenth of the area of the United States, it produces at least two-thirds of its manufactured products, and is the home of nearly half its population. In the United States there are thirteen cities with more than 500,000 inhabitants.¹ Eleven of these cities are in this belt. It is clear that we must include this industrial expansion as an additional explanation of the close settlement in the Eastern Agricultural Region.

Why has such great industrial development taken place in this area ?

(1) It contains the most productive mines of the Appalachian coal-field and three-tenths of the water-power developed in the United States ;

(2) It includes the northern Atlantic states which turned to commerce and manufacture because their conditions were unfavourable for agriculture ;

(3) It includes the Atlantic ports where immigrants from Europe landed, and thus had ample labour, both skilled and unskilled ;

(4) The navigable waterway of the Great Lakes, after the construction of the " Soo " canals, provided cheap transport for the iron ore from Lake Superior (Fig. 30) to (a) the main centre of the steel industry round Pitts-

¹ New York, Chicago, Philadelphia, Detroit, Los Angeles, Cleveland, St. Louis, Baltimore, Boston, Pittsburgh, San Francisco, Milwaukee, Buffalo.

burgh, where the iron meets coke from the Pennsylvanian coal-mines, (b) to the Lake Shore Region, centred round Cleveland, Buffalo, South Chicago, and Gary, which is the second steel-producing district ;

(5) It includes part of the Corn Belt, so that Chicago has become the great meat-packing centre of the United States ;

(6) Owing to the ample supply of timber originally available, paper-making and wood-pulp factories were established in this area ;

(7) The construction of the Erie Canal and, later, of many lines of railway brought the great and expanding markets and sources of raw materials in the Interior Plain into close touch with the Atlantic ports, through which passes the bulk of the country's export and import trade.

THE TRADE OF THE UNITED STATES

When we analyse the trade of the United States with other parts of the globe, we find that three-fifths of the country's exports are manufactured articles, either ready for use or still to undergo further treatment. Of these the most valuable are machinery and vehicles (one-quarter of total exports), petrol and other refined oils (over one-eighth), motor-cars, and iron and steel products. Nearly a quarter is raw materials (chiefly cotton). The remainder is food-stuffs, both manufactured and unmanufactured, of which the most valuable are tobacco, fruits, wheat, and wheat-flour.

In spite of its great export of manufactured products, the United States has a large import of goods in this class, amounting to more than two-fifths of the total imports. Partly these are articles which are to undergo the final processes of manufacture in the United States, such as wood-pulp ; but to a large extent they are the products of specially skilled workmen in European countries, such as the mass-production methods of the United States are unable to supply. On the other hand, more than one-third of the imports is raw materials for American factories

(chiefly raw silk and rubber), and the remainder is food-stuffs, largely tropical products, such as coffee, cane sugar, vegetable oils, nuts, and fruits.

CITIES OF THE UNITED STATES

Half this commerce with countries overseas passes through **New York** (pop. 6,930,000), which is the largest city in the New World. Henry Hudson's exploration of the Hudson River led to the Dutch settlement of New Amsterdam at its mouth on Manhattan Island. When acquired by the British this settlement was renamed New York. By the Hudson-Champlain Gap New York has easy access to Montreal in the St. Lawrence Lowlands ; by the Mohawk Gap it shared in the western fur trade (Fig. 22). Its rise as a world port dates from the spread of population along the shores of Lakes Ontario and Erie, and the opening, in 1825, of the Erie Canal through the Mohawk Gap. Since 1880 the canal traffic has been decreasing ; but railways and ocean routes have multiplied, converging on New York, and maintaining the city's superiority to all rivals. New York is also sufficiently near the Appalachian coal-field and oil-fields in the Interior Plain to secure cheap fuel for the manufactures—clothing, printing, machinery, meat-packing, and sugar-refining—that naturally arise amidst a great population and at a commercial port ; and with the growth of industry and trade the city has extended on to the mainland, far beyond the limits of Manhattan Island.

New York's rivals as seaports are **Boston** (781,000), **Philadelphia** (1,950,000), and **Baltimore** (804,000). The two last are " Fall Line " cities (as also is **Washington**, the capital of the United States), but neither has such easy communications with the Interior Plain nor such a favoured situation for a seaport as New York. Sugar-refining and woollen manufacture are the leading industries of Philadelphia, clothing that of Baltimore. **Boston** is nearer Europe than New York, and serves a manufacturing area with a large population, thanks to its long-established leather and textile industries, but is cut off from easy

access to the Mohawk Gap by the rugged New England Plateau.

We have noted the district round Chicago as the slaughtering and meat-packing centre of the United States (p. 114), and also (p. 121) as a centre of steel production. Its position as a "corner-town" near the south end of Lake Michigan, where the lake projects into the fertile Low Plains, has made **Chicago** collecting, distributing, and manufacturing capital of the "Middle West," and second city of the United States (3,376,000). It is a terminus of nearly every important railway west of the Appalachians, and has railroad connection with Canada, while the Great Lakes provide cheap water transport. **Milwaukee** (578,000), also situated on Lake Michigan, shares in a smaller way the advantages of Chicago, but depends more upon its meat, machinery, leather, and textile industries than on commerce.

Detroit (1,568,000) and **Cleveland** (900,000), respectively between Lakes Huron and Erie and on the southern shore of Lake Erie, are natural meeting-places of Lake Superior iron and Appalachian coal, and close to the largest markets in North America. The motor industry became centred in Detroit probably because cheap mass production was first applied there in the factory of Henry Ford. To a less extent Cleveland includes this industry amongst many other varieties of iron, steel, and machinery manufactures. At the east end of Lake Erie and the western exit of the Mohawk Gap, **Buffalo** (573,000) has great advantages for the assembling of bulky raw materials—grain, lumber, coal, iron, and cattle—and very cheap power from Niagara Falls. It is the second centre of flour-milling in the world, and Chicago alone has larger stock-yards.

Though the Mississippi is to-day little used as a means of Transport, **St. Louis** (821,000) owes its early development to its situation near the junction of the Missouri and Ohio, with the Mississippi, that is, at a crossing of east-west and north-south routes. This gave it such commercial

importance as to attract five main lines of railway. These in turn have made it a marketing centre for maize, wheat, cattle, and pigs, and a manufacturing centre to supply the agricultural population of the Central Plains.

The population of the Pacific states (California, Washington, Oregon) is increasing at a much faster rate than that of any other part of the country. These states contain five cities with more than 250,000 inhabitants (**Seattle, Portland, Oakland, San Francisco** (634,000), and **Los Angeles** (1,238,000), which has more than doubled its population in the last ten years. Both Los Angeles and San Francisco depend upon electricity generated from water-power. Los Angeles has the more pleasant climate to attract tourist and health-seeker, from which advantage it has developed its enormously important film industry, and, though its port of San Pedro is an artificial harbour, ten miles distant, clears twice the tonnage of San Francisco.

ALASKA

Alaska, which was bought by the United States from Russia, lies partly in the **Tundra and Birch-Larch Forest Region** and partly in the **Pacific Coast Region**. It has the same position in North America that Norway, Sweden, and Finland have in Europe, and is larger than the combined areas of these countries, but contains only 60,000 people, compared with their 12,000,000 inhabitants. Alaska, as you will see if you look at a globe, is nearer to the mainland of Europe than any other part of the United States, though an airship route from Port Barrow in Alaska to Norway would pass over the North Pole. Man's desire for Speed may some day create regular routes over the frozen Polar Sea.

The chief industries of Alaska are salmon-fishing and mining. The discovery of gold first drew attention to its minerals; but the annual production of copper is now twice as great as that of gold. There are salmon-canning and sawmill industries, the latter using the large timber resources of the Pacific Coast Region. The largest herd of

fur-seals in the world is in the Pribilof Islands in the Bering Sea between North America and Asia.

EXERCISES IV

A

1. On a blank map print each name with a dot to show the position of the thirteen cities mentioned on p. 120.
2. Write these names over areas where each is obtained: copper, lead, iron ore, petroleum, gold, bauxite, cane sugar, tobacco, wheat, oranges, dairy produce.
3. Name four important productions of U.S.A. not mentioned in Question 2.
4. Which are the cotton-growing states of U.S.A. ? What natural advantages have they for growing the cotton ?
5. In what part of U.S.A. is the population most dense? Say why. Where is the population sparse ?
6. What is meant by the "corn belt" ? Where is it ? What is its chief town ? Say what advantages of position this town has.
7. Name :
 - (a) The greatest grain and meat centre of U.S.A.
 - (b) The chief iron and steel town of U.S.A.
 - (c) A tobacco port of U.S.A.
 - (d) A fruit-exporting town of U.S.A.
 - (e) A shipbuilding centre.
 - (f) A textile centre.
 - (g) The capital of U.S.A.
 - (h) A motor-car centre.
8. Explain the term "Fall Line," and name the towns situated on it.

B

1. Draw a sketch map of the district round the Five Great Lakes. Enter on your map: Soo Canals, Welland Canal, Niagara Falls, Duluth, Chicago, Milwaukee, Cleveland, Buffalo, Montreal, Erie Canal, L. Champlain, Toronto, Hamilton, Detroit.
2. What are the natural advantages that make the north-eastern states of U.S.A. the greatest manufacturing section of that country ?
3. Trace on the map the following railways, and state the economic areas through which each runs, and how it traverses the physical barriers it has to pass: (a) New York-Buffalo-Chicago; (b) San Francisco-Omaha; (c) New York-New Orleans.

4. Explain why : (a) New York has built skyscrapers ; (b) trees are of such dimensions in California ; (c) there is so great production of labour-saving and automatic machinery ; (d) there is such a large negro population ; (e) the film industry has become centred in Los Angeles.
5. Compare California with the New England states in (a) relief, (b) climate, (c) occupations, (d) exports.
6. Compare the order in which cotton, maize, tobacco, and wheat are cultivated from north to south in the Mississippi basin, with their distribution in the basin of the River Plate. Why is the production of cotton and tobacco in the Plate basin relatively undeveloped ?
7. Write short notes on the position of : New York, St. Louis, San Francisco.

THE DOMINION OF CANADA

The great obstacle to Canada's expansion westward was the surface of the Canadian Shield. Across 1000 miles of barren rock there were routes for the fur trader's canoe, but none for the settler's wagon. Only the building of railways bridged this gap between the St. Lawrence Lowlands and the wheat lands of the west. The first settlement beyond the margin of the Canadian Shield was made by some of the immigrants, who came in a steady flow from England and Scotland after the Napoleonic Wars, in the Red River district south of Lake Winnipeg. The wheat lands, however—to-day the Prairie Provinces of Manitoba, Alberta, and Saskatchewan—were part of Rupert's Land, and were kept by the Hudson Bay Company as a reserve for the fur trade. In the meantime British Columbia on the Pacific coast had been explored from seaward by Vancouver and across the passes of the Cordillera by Mackenzie, and in 1858 had become a separate colony. In 1867 the colonies on the Atlantic coast united as the Dominion of Canada.

To secure communication with British Columbia and bring it into the Dominion, Rupert's Land was purchased from the Hudson Bay Company, and the Canadian Pacific Railway was carried over the Rockies by Kicking Horse Pass to Vancouver. Later other lines (Canadian National Railways) were built over a northern pass (Yellowhead

Pass) (1) from Quebec by Montreal, Ottawa, Fort William' and Winnipeg to Vancouver; and (2) from Quebec by Cochrane, Winnipeg, and Edmonton to Prince Rupert, and also (by the C.P.R.) over a southern pass (Crow's Nest Pass) to Spokane in the United States. From Cochrane a railway has been constructed to Moosonee on James Bay.

It was not, however, till early in the present century that many farmers settled in the Prairie Provinces, when extension of the railway system brought vast areas into touch with markets. The latest district to be opened by the railway for settlement is the Peace River country north-west of Edmonton. The Canadians are more than half English, Scots, or Irish in origin, while nearly three-tenths are French. The bitterly cold winter of the prairies often makes life very hard for people of British race; and there many of the settlers are peasants from the Slav countries of eastern Europe, who are content with few comforts, and accustomed to the severity of a continental climate.

CANADA : AGRICULTURE

(a) The **Eastern Agricultural Region** (Fig. 27) extends north-west over the Great Plains in Canada because lower temperature and less evaporation than occur in the United States leave sufficient moisture in the soil for farming. The fertile Black Earth soils (p. 115) stretch as far north as Edmonton, and are also found in the Peace River district. Thus the Great Interior Plain is the Canadian wheatlands, that raise the country's most valuable crop (Fig. 29). Although Canada grows only half as much **wheat** as the United States, her smaller population (10,370,000) means fewer mouths to feed, so that she has more wheat to export (Fig. 7).

After being cut and gathered, one-fifth of this export wheat moves westward to be shipped from Vancouver. Most of the wheat, however, is railed to great "elevators" at Fort William and Port Arthur on Lake Superior, whence more than half of the whole quantity for export is shipped eastward by the St. Lawrence before navigation is closed by

ice. A small quantity is exported after the closing of the St. Lawrence from Halifax in Nova Scotia ; one-quarter of the whole export passes into United States territory, and travels by way of Buffalo and the Mohawk Gap to be shipped at New York. The new line of railway recently opened from the wheat country to Churchill on Hudson Bay offers an alternative to the St. Lawrence route during the months that Hudson Strait is ice-free. Thus the St. Lawrence has to-day both Hudson Strait and the Mohawk Gap as competitors in the export of wheat, as in the days of French Canada they were rivals in the export of furs.

Oats are grown on the northern margin of the Spring Wheat belt, where the growing season is shorter and cooler than that best suited to wheat. Other important crops are barley, hay, clover, alfalfa, potatoes, turnips, tobacco (Quebec, Ontario), maple (for maple syrup and sugar), sugar beet (Ontario, Alberta), and apples (Nova Scotia). Still farther north lies the belt of coniferous forest. Here the quality of the **timber** is in general less suitable for lumber than for wood-pulp, which is used in great quantities by the paper industries, not only of Canada but also of the United States ; because this latter industry, having exhausted its supply of local timber in the north-eastern states, finds it cheaper to import wood-pulp from Canada than to pay for the long railroad haul of timber from the Pacific coast.

(b) Beyond the pine forests birch and larch trees predominate in the woods of the **Tundra and Birch-Larch Forest Region**, until the tree covering dwindles into brushwood and tundra. But that agriculture is impossible does not mean that these northern lands are valuable only for timber. The forests are the home of fur-bearing animals—mink, marten, bear, wolf, and beaver, while the flowering plants, mosses, and lichens of the Arctic Prairies will some day graze vast herds of musk-ox and reindeer as one of the great meat-producing lands of the world.

(c) **Fisheries.** On the continental shelf east and south of Newfoundland as far as Cape Hatteras the cold Labrador

Current from Davis Strait meets the warm Gulf Stream Drift. Here, therefore, especially on the submerged plateaus known as the **Banks of Newfoundland**, all the necessary conditions unite to create some of the richest fishing-grounds in the world (p. 45), worked by vessels from the Canadian Maritime Provinces, Newfoundland, and the north-eastern United States. The most valuable catches are those of halibut, lobster, cod, and herring.

(d) The **Maritime Provinces** (Nova Scotia, New Brunswick, and Prince Edward Island) are almost cut off from the rest of the Dominion by the northward extension of United States territory in Maine. Their summers are slightly warmer than in the south of England, but the north-west winds of winter (Fig. 23) bring bitter air from northern Quebec. The best agricultural land is in Prince Edward Island and the Annapolis valley on the south shore of the Bay of Fundy, hay, potatoes, and oats being the principal field crops. Nova Scotia rivals British Columbia in production of **apples**; and **fox-farming** is a flourishing industry. The three provinces contain one-tenth of the population of Canada, the ice-free ports of **Halifax** and **St. John** (New Brunswick) being the largest towns.

(e) We have noted in Chapter I. (p. 22) the influence of the Westerlies in bringing a mild winter climate to the Canadian portion of the **Pacific Coast Region**. This district has the dairy farms, market gardens, and orchards, that are characteristic of the same Region within the United States (p. 116), though the most productive industry is **lumbering**. As in the United States, also, there are rich **fisheries** and a **canning industry**, the fisheries of British Columbia being even more valuable than those of the Maritime Provinces.

CANADA : MINERALS AND POWER

Canada ranks first among countries of the world as a producer of asbestos, nickel, and cobalt, third in gold and silver, and fourth in copper, lead, and zinc, although the greater part of her enormous area is still unexplored for

minerals. Her coal resources are as yet little developed. There are bituminous coal-fields in Alberta, British Columbia, and Nova Scotia, while lignite occurs in Saskatchewan. The amount of coal imported from the United States is equal to the whole coal output of Canada, because the distance of the Canadian manufacturing region in Ontario and Quebec from the Canadian coal-fields in Nova Scotia and Alberta is many times greater than that from the nearest coal-producing areas of the United States.

To some degree this lack of coal in Ontario and Quebec is made good by **water-power**, four-fifths of the developed water-power being in these provinces, because of the natural reservoirs they possess in the lakes of the glaciated Canadian Shield and in the Great Lakes. From Niagara Falls about 700,000 h.p. is developed annually, divided between Canada and the United States. A scheme is also under consideration to obtain water-power from the St. Lawrence, at the same time making a 27-foot deep waterway to the head of the Great Lakes. The most productive petroleum district is the Lake Peninsula between Lakes Huron and Erie ; but there are vast areas in the Prairie Provinces and the basin of the Mackenzie River, which may prove rich in oil.

From the **Cordillera**, which is so rich in minerals in the United States, British Columbia furnishes most of Canada's lead, copper, and zinc, besides silver and gold. Gold is also mined in Yukon Territory, north of British Columbia. The **Canadian Shield** in Ontario is one of the world's great storehouses of minerals. Sudbury yields most of the world's production of nickel, copper being mined along with the nickel. Silver and cobalt (used for colouring glass) are mined in the Cobalt district, and gold near Timmins. Ontario produces most of Canada's silver and gold ; from Quebec come zinc and asbestos, from which fireproof materials are manufactured.

CANADA : INDUSTRY AND CITIES

The settlement of the Prairie Provinces greatly increased the Canadian market for manufactured goods, and

led to a development of industries which has made Canada the most highly industrialised of the younger nations, though the workers in Canadian factories do not number one-twelfth of those employed in the United States. The leading Canadian industries are those which use Canada's own abundant raw materials—pulp and paper, flour and grist mills, slaughtering and meat-packing, and sawmills. Other industries based on imported raw materials have also grown up, such as manufactures of motor-cars, and of cotton and rubber goods, and sugar refining. Blast-furnaces and steel plants at Sydney, Cape Breton Island, use Nova Scotian coal to smelt iron ore from Wabana in Newfoundland (Fig. 30); and smelting is also carried on in British Columbia. About half the 10,376,000 inhabitants of Canada are town-dwellers.

Ottawa is the capital of the Dominion; but the largest industrial city is **Montreal** (pop. 810,000), which stands on the St. Lawrence where water transport is interrupted by the Lachine Rapids, and where other routes converge (1) by the Ottawa River from Lake Huron, and (2) from New York by the Hudson-Champlain Gap. It is thus a great railway centre and market, and also the second largest port in North America, handling one-quarter of Canada's export trade. It contains some 3000 factories, including very large flour mills, for it is the greatest grain port in the world. More than half its population is French.

Canada's eastern port—the French city of **Quebec** (129,000)—was founded by Champlain to command the St. Lawrence and to keep open communication with France. Quebec is still the easiest outlet for large passenger liners in summer; for above the city the fairway of the St. Lawrence requires to be resurveyed every year. Quebec

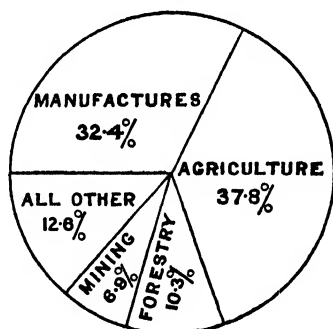


FIG. 32.—Value of Production of Industries—Canada.

manufactures wood-pulp with power derived from the rivers of the Canadian Shield.

The second industrial city is **Toronto** (627,000), the capital of Ontario. Its industrial power, like that of Buffalo, is obtained from Niagara Falls. Situated on a fine harbour on Lake Ontario, it is distributing centre for the Lake Peninsula. **Hamilton** (154,000) is an industrial city in the Lake Peninsula.

As the world's greatest grain market **Winnipeg** (217,000) has also developed industrially, driving flour-milling factories by electric power. It is the commercial centre of the Prairie Provinces, because of its situation between the southern end of Lake Winnipeg and the United States frontier. Through Winnipeg every train that crosses Canada must pass. **Calgary** and **Edmonton** are, after Winnipeg, the largest cities of the Prairie Provinces ; while the Dominion's great Pacific port, **Vancouver** (245,000), is developing with the increase of trade with Eastern Asia and with Europe by the Panama Canal.

THE TRADE OF CANADA

Canada's exports are chiefly the natural products of the country, partly in a raw state, partly after undergoing manufacture. Wheat and wheat-flour account for more than one-quarter, wood and wood products (including paper) for three-tenths, animals and animal products for one-tenth, and minerals for two-tenths of the total. Great Britain takes one-quarter of the exports, and supplies three-twentieths of the imports.

NEWFOUNDLAND

Newfoundland, a Dominion of the British Commonwealth, is about the same size as England, and is situated nearer the Equator. It contains, however, a population of only 271,000, because it has poor soils, a growing season too short for agriculture as it is surrounded by the cold waters of the Labrador Current, and a Tundra vegetation. Its chief industries are the manufacture of **wood-pulp** and

paper, and **fishing**, for which it is well equipped with the natural harbours characteristic of the Atlantic coast north of Chesapeake Bay. The capital, **St. John's**, is an ice-free port. Opposite the island on the mainland is its dependency of **Labrador**, whose timber, water-power, and (probably) minerals are as yet undeveloped.

EXERCISES V

A

1. On a map of Canada name the provinces and show the boundary lines. Insert the name of the chief town in each province. Include Newfoundland.
2. Write these names over the areas noted for their supply : Gold, cobalt, asbestos, iron ore, coal, water-power, cod, wheat, apples, sugar beet, furs.
3. On your map trace the lines of the Canadian Pacific and the Canadian National Railways. Name the eastern and western termini, and important intermediate stations.
4. Name : (a) the capital of Canada ; (b) a salmon river ; (c) a salmon and fruit-tinning town ; (d) the greatest grain market ; (e) the greatest grain port ; (f) an iron and steel town ; (g) a fishing port ; (h) a port on Hudson Bay.
5. What is an elevator ? What two purposes does it serve ? Where are they to be found in Canada ? What is a " whale-back " ?
6. Explain why : (a) fogs are prevalent off Newfoundland ; (b) Ontario is called the Garden of Canada ; (c) irrigation is necessary in Alberta ; (d) Manitoba is suitable for wheat-farming.
7. What are the five types of farming in Canada ? Name areas for each.

B

1. Will the St. Lawrence Lowlands and the Lake Peninsula continue to be the leading manufacturing and commercial region of Canada ?
2. What are the exports which Canada sends to Great Britain ? Why should they be only three-fifths as great as those sent to the United States ?
3. Newfoundland is nearly as large as England but has a very much smaller population. Explain this fact.
4. What are the agricultural and mineral products of the Maritime Provinces ?

MEXICO

The area of Mexico is about one-fifth of that of Canada, but it contains a larger population (16,404,000). Physical barriers prevent a real development of the country, because they have not yet been overcome by the construction of an adequate system of roads and railways. About 9,000,000 people, who live on the Plateau, are cut off by the west and the east Sierra Madre from the 5,000,000, who live on the coastal slopes. Above the Plateau rise lofty volcanoes, such as Orizaba (18,206 feet) and Popocatepetl (17,881). Yucatan is further isolated by a belt of tropical forest, Lower California by desert and the Gulf of California. **Mexico City**, the capital (pop. 960,000), is a modern town, beautifully situated on the Plateau, and connected by rail with its port of **Vera Cruz** on the east coast, while **Puebla** (111,000) drives cotton mills with electric power; but Mexico as a whole has hardly advanced beyond the condition of a pastoral and mining country.

The Mexicans recognise three different types of climate in their land. They speak of areas below 3000 feet, where the temperature may rise about 100° F., as "Hot Lands"; those between 3000 and 6000 feet they term "Mild Lands"; while areas higher than 6000 feet are "Cold Lands." The "Mild Lands" of the Mexican Plateau belong to the **Western Grazing and Irrigated Crops Region** (Fig. 27). Here there is sufficient rainfall to allow the cultivation of **maize**, while **beans** are grown with the help of irrigation. These two crops supply the Mexicans with most of their food. On the Plateau sugar cane, cotton, and tobacco are also cultivated. In the "Hot Lands" that belong to the **Tropical Region** henequen, or **sisal**, is exported from Yucatan Peninsula for manufacture into rope, which is used in great quantity by the farmers of the United States.

As in the United States and Canada, the Cordillera in Mexico yields minerals—lead, copper, zinc, silver, and gold. Mexico is the world's chief source of silver, second in pro-

duction of lead, and fourth in gold. Near Durango are great deposits of iron ore. The country is also amongst those Caribbean lands that supply petroleum, the chief **oil-fields** lying inland from the coast of the Gulf of Mexico near the oil ports of Tampico and Tuxpan.

CENTRAL AMERICA AND THE WEST INDIES

These lands lie in the **Tropical Region**, where crops are suited to a climate both hot and moist (Fig. 27). All these countries and islands, however, have not developed their resources to an equal extent. In some, such as Costa Rica, Cuba, and Porto Rico, half or more of the inhabitants are white ; in others, such as Honduras, Jamaica, Haiti, and Santo Domingo, the majority is descended from Indians or negro slaves. Some (Porto Rico, the Virgin Islands, Cuba, Santo Domingo, Haiti, and Nicaragua) have come into the possession or under the influence of the United States ; and these have, in greater or less degree, been developed by American enterprise. Others are colonies of European countries.

In the days of sail some of the West Indian Islands were desired by naval powers because of their fine harbours and their situation at an angle of the Atlantic Trade Route (Fig. 11), as well as because of their production of sugar. Cromwell took **Jamaica** from the Spaniards, and St. Lucia, Antigua, and Barbados became British naval bases. A settlement of Buccaneers, made at the mouth of the Belize River for the purpose of cutting logwood, developed into the colony of **British Honduras** ; while the **Bahamas** and the **Bermudas** in the Atlantic also became British possessions.

The most important products raised on the hot, moist lowlands of this Tropical Region are **sugar** and **bananas**. Cuba supplies nearly one-third of the world's cane sugar (Fig. 9), which is also grown in Porto Rico. British West Indian sugar has not found such a good market in Great Britain as these two islands have in the United States, so other crops have been developed. Jamaica exports quanti-

ties of bananas, a fruit which is also important in Honduras, Guatemala, and other Central American republics. Cacao is grown in Trinidad, coco-nuts, cotton, and limes in Antigua and St. Lucia. Both Cuba and Porto Rico raise tobacco, while coffee is cultivated on the Central American highlands. Both on the mainland and on the islands tropical forests yield cabinet and dye woods (mahogany, ebony, cedar, logwood, sandalwood).

The seaway to Eastern Asia, in search of which Columbus crossed the Atlantic, came into existence in 1914 when the first ship sailed through the **Panama Canal**. Its construction in an area where yellow fever and malaria were prevalent was a triumph both for American engineering skill and for medical science. Its effect has been to bring New York 8000 miles nearer San Francisco than by the former route round South America. Further, all ports in eastern Asia north of Shanghai are now a shorter voyage from New York than from Liverpool ; so also are all places in Australia east of Adelaide, all ports of New Zealand, and the western coast of South America (p. 92).

EXERCISES VI

A

1. On a blank map of Mexico insert :
 - (a) East and West Sierra Madre, Gulf of Mexico, Gulf of California, Orizaba, Yucatan, Mexico City, Puebla, Vera Cruz, Tampico, Tuxpan.
 - (b) Mark, by shading or otherwise, the three climatic zones.
2. On a blank map of Central America and West Indies name the states of Central America and the six principal islands (or groups of islands), including Trinidad.
3. Make a list of the minerals of Mexico.
4. Name areas noted for the supply of : Bananas, cane sugar, logwood, mahogany, henequen, beans, pineapples, rum, cacao.

B

1. How did Great Britain first come to own possessions in the West Indies ? Name the principal ones. Describe the climate of Jamaica. Name two negro republics.

2. Will Mexico ever become an important industrial country ?
What advantages has she already for this purpose ? What
must still be done before the aim can be achieved ?
3. Is the Panama Canal more important to Great Britain or to the
United States ? Give reasons for your answer.
4. Compare Mexico with Canada in respect of area, number and
type of inhabitants, products, railways. How do you
explain the difference in material development ?

CHAPTER VI

AFRICA: PROBLEMS OF WATER AND COMMUNICATIONS

HIGHLANDS AND LOWLANDS

(a) **Northern and Southern Plateaus.** The simplest way to understand the structure of Africa is to think of that continent, together with Arabia, as composed of

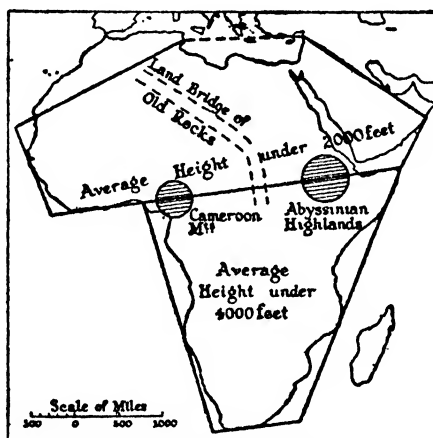


FIG. 33.—Africa : Structure.

two plateaus (Fig. 33), of which the Northern is about half the average height of the Southern.

These are connected by three mountain areas :

- (1) In the east the **Abyssinian Highlands** ;
- (2) In the centre a **Land Bridge of Old Rocks**, which runs north-westward from **Ruwenzori** (about 16,800 feet) to the **Ahaggar Plateau** ; and
- (3) In the west the **Cameroon Mountains**, Cameroon mountain itself (13,350 feet) being an active volcano.

Because of this plateau formation, the continent has a coast-line that is cut by few inlets and natural harbours, and the river courses are much broken by waterfalls. The edges of the plateaus, falling steeply on to narrow coastal plains, continue their abrupt descent below sea-level, so that deep water comes close to the shores. Thus Africa has no great fishing-grounds.

The **Southern Plateau** slopes down to the **Congo Basin** from the highlands of East Africa and from its lofty southern rim, which reaches heights of 11,000 feet in the **Drakensbergs**. This southern rim descends to the coastal plain by the two steps of the Great and Little Karroo plateaus.

The height of the highlands of East Africa is the result of the outpouring of lava by volcanoes, due to a break in the earth's crust. It is believed that, at a very distant period in the past, a long, low arch ran from south of the Taurus mountains in Asia Minor to the east coast of Africa about Beira. At a later period the upward pressure which supported this arch was removed, the sides of the arch cracked, and the dome sank between them. The cracks went so deep into the earth's crust that they reached molten rock below it; and through the cracks lava was squirted, to form mighty volcanoes, such as **Kilimanjaro** (19,320 feet) and **Kenya** (17,040), which to-day stands snow-capped on the Equator. Most of these volcanoes are now extinct.

The cracked sides of the old arch rise as escarpments above the **Great Rift Valley** (Fig. 34), whose length is

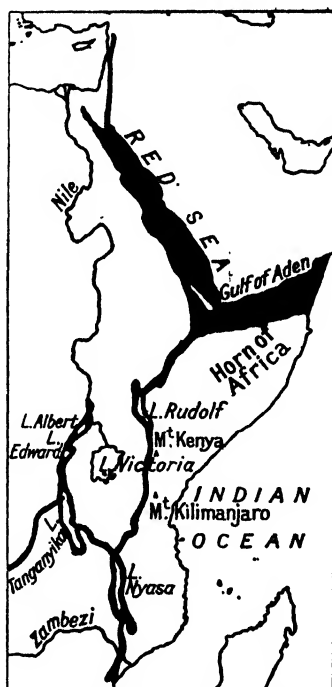


FIG. 34.—The Great Rift Valley.

6000 miles, or nearly a quarter of the earth's circumference. It is 40 miles wide in Kenya, 250 in parts of the Red Sea. At the southern end of the Red Sea the main Valley is met by a second rift valley, which forms the Gulf of Aden, while, from the north end of **Lake Nyasa**, a Western Rift Valley runs northward, on whose floor lie **Lake Tanganyika**, the second deepest lake in the world (4190 feet), **Lake Edward**, and **Lake Albert**. On the plateau between the main and Western Rifts lies the wide but shallow **Lake Victoria**.

The western escarpment of that part of the Great Rift Valley, which rises above the Red Sea as the Abyssinian highland and the Nubian highlands, forms a high eastern rim to the **Northern Plateau**. The more broken southern rim of this plateau rises inland from the Gulf of Guinea as the **Futa Jallon Mountains**, the **Bauchi Plateau**, and the Cameroon Mountains.

(b) **Folded Mountains**. The folded mountain ranges of the New World (North and South America) run from north to south, parallel to the shores of the Pacific Ocean. In the Old World (Asia, Europe, and Africa) they run from west to east as the Alpine-Himalayan mountain system. A loop from the western end of this mountain system curves from Spain through north-western Africa as the **Atlas Mountains** (Fig. 61), which stretch for 1500 miles roughly parallel with the coast-line. The lower northern range of the Tell Atlas overlooks the coastal plain of the Tell along the Mediterranean, and is separated by the Plateau of the Shotts (salt lakes) from the loftier southern ranges.

CLIMATE

The north and south coasts of Africa lie almost equally distant from the Equator, most of the continent being within the Torrid Zone, and only relatively small areas within the North and South Warm Temperate Regions. No high mountain barrier interferes with the free movement of air currents, as in South and North America, so that

in Africa we have the best example of climates produced by the great wind belts of the globe.

In the north the Atlas Mountains and a strip of coast along the Mediterranean Sea have winter rain from the Westerlies and summer drought from the Trades ; and similar conditions prevail in a district in the Cape of Good Hope Province of South Africa in the extreme south-west of the continent (Figs. 35, 36).

Next to these two areas of "Mediterranean" climate

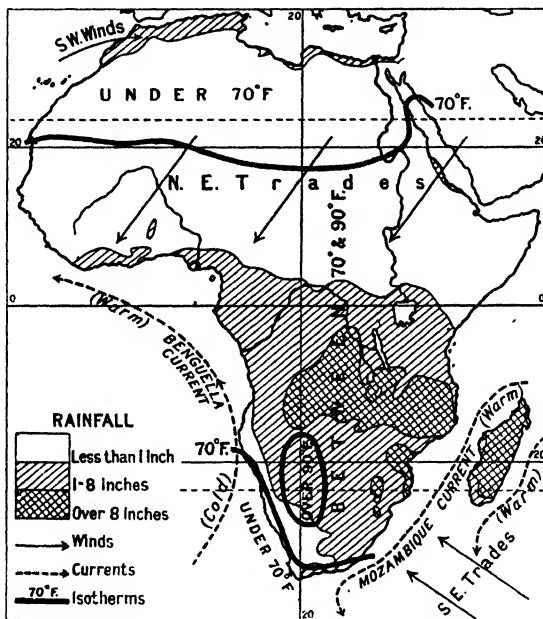


FIG. 35.—Africa : Climate—January.

lie the belts on the poleward side of the Tropics in which the North-east and the South-east Trades respectively blow throughout the year. In northern Africa the North-east Trades are dry winds in both winter and summer because they have blown over great land areas. The South-east Trades, on the other hand, reach South Africa from the ocean, and both in winter and in summer bring rain to the seaward edge of the plateau and the coastal plain. As in eastern South America, however, rain is not carried farther

inland in (southern) winter (p. 77). At this season temperatures over the southern end of the plateau are low (Fig. 36), so that atmospheric pressure becomes high. From this high pressure centre winds blow outward, which fend off the Trades. In January (Southern summer), on the other hand, the Southern Plateau is the hottest part of Africa (Fig. 35), so that a centre of low pressure is formed, towards which the Trades are drawn far inland.

Between the two Tropics, Figs. 35 and 36 show the

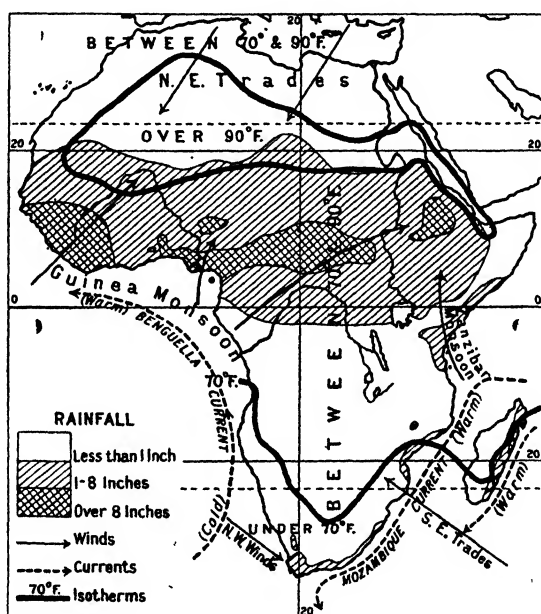


FIG. 36.—Africa : Climate—July.

shift of the very heavy rainfall of the Doldrums with the (apparent) movement of the sun. The summer rains extend as far north in July as 20° N. latitude because the great heat of northern Africa creates a huge area of low pressure, with the result that moisture-laden air is drawn far inland from the Gulf of Guinea and the Indian Ocean. As the winter winds of northern Africa are the North-east Trades, there is thus a reversal of the direction of the winds in different seasons of the year, such as occurs in the

Monsoon Region of Asia (p. 20). These summer winds are therefore Monsoon Winds.

NATURAL VEGETATION

Tropical Forests. Great heat and an annual rainfall of from 60 to 160 inches (1) in the northern half of the Congo basin, (2) on the southward-facing slope of the Northern Plateau and the coastal plain along the Gulf of Guinea, and (3) on the windward slope of the Plateau of Madagascar, produce dense Tropical Forests (Fig. 37). These forests yield some timber, wild rubber, gum copal, raffia (from the raphia palm), palm wine, and kola nuts.

Savannas. North of the Tropical Forest as far as the latitude of Lake Chad, east to the edge of the Great Rift Valley, and south to the Tropic of Capricorn, where the rainfall varies greatly from year to year but averages between 30 and 60 inches annually, with a dry period of several months, stretch Savannas. These vary in character according to the rainfall, with tufted herbs and grasses here 12, there 3 feet high, with tall trees in open, park-like growth, or occurring only as scattered, stunted individuals. They include the big game lands of Africa, grazed by herds of elephants, giraffes, antelopes, and zebras, the prey of the lion and the leopard.

Thorn Scrub. Northwards towards the 20th parallel of latitude, eastwards towards Cape Guardafui, and south-westwards towards the Orange River, the rainfall decreases to between 20 and 10 inches, and the dry period lengthens to two-thirds of the year, coming in seasons of high temperature. Here the vegetation changes to desert grass, with small thorny trees and bushes, which supply grazing for camels, goats, and donkeys. The principal trees are acacias, from one variety of which is obtained gum arabic. In general this Thorn Scrub country can support only wandering herdsmen.

Deserts. The summer rains over northern Africa die away along a line 800 or 1000 miles distant from the narrow strip along the Mediterranean coast that receives some

winter rain (Fig. 35). Between lies the greatest Trade Wind Desert in the World—the **Sahara**, which is continued eastwards into Arabia. Even the Sahara is not entirely without vegetation, for some rain does fall, though, except on the mountains, only at very long intervals. This rain is stored up in the dry watercourses, or “wadis,” and in basins where there is impermeable rock underneath the sand, and supplies water for date-palms in the oases that make possible the crossing of the desert by camel caravans. A desert strip fringes the coast of the Red Sea, the Gulf of Aden, and the Indian Ocean as far south as the Equator ; and there is a third area of drought in the south-west of the continent, north of the winter rain district in the Cape of Good Hope Province (Fig. 36) and west of the limit of (southern) summer rain (Fig. 35). The dry **Kalahari** district lies in the area of very high summer temperature (over 90°).

Temperate Grassland is found south of the Tropic of Capricorn on the High Veld (over 5000 feet) of the southern Transvaal and the Orange Free State, where there is an annual rainfall of 35 to 40 inches, and in smaller areas in the northern Transvaal and Southern Rhodesia. The highlands of Abyssinia, of the plateaus that border the Eastern and Western Rift Valleys, and of the Cameroon Mountains, thanks to their greater altitude and higher rainfall, have a covering of mountain grass which is green throughout the year.

Typical **Winter Rain Vegetation** occurs along the Mediterranean coast and in the south-west of the Cape of Good Hope Province. One-tenth of the world's olive oil comes from the Tell coastal plain and the slopes of the Atlas Mountains.

EXERCISES I

A

1. Find on your map these names : Indian Ocean, Gulf of Guinea, Delagoa Bay, Red Sea, Mediterranean Sea ; Equator, Tropics of Cancer and Capricorn ; Mounts Kenya,

Kilimanjaro ; Atlas Mountains, Drakensberg, Cameroon, Abyssinian Highlands ; the Great and Little Karroo.

2. Name areas which exhibit these features : (a) Convectional Rain ; (b) Summer Drought ; (c) Trade Wind Desert ; (d) Orographical Rain ; (e) Summer Rain ; (f) Mediterranean Climate.
3. On a blank map of Africa name the vegetation zones north and south of the Equator. How many are there ?
4. In South Africa Christmas occurs in mid-summer. Explain how this comes about. Explain (a) Northern, (b) Southern, Summer and Winter.
5. What are the vegetation characteristics of : (a) Savanna ; (b) Tropical Forest ; (c) Thorn Scrub ?
6. Name animals typical of these regions : (a) Guinea ; (b) Congo ; (c) Egypt ; (d) South Africa.

B

1. Africa consists of two big plateaus. What influence has this fact upon (a) Coast-line ; (b) Rivers ; (c) Seaports ?
2. Explain the term " Rift Valley," and say how it was probably formed. What difference is there between it and a canyon ?
3. Explain (a) folded mountains ; (b) dissected plateau ; (c) escarpment.
4. How is it that Africa gives the best example of climates produced by the great wind belts of the globe ?
5. Explain what is meant by Monsoon Winds. In what part of Africa are they to be found ?
6. Give the position of the great stretch of desert in Africa. Account for the desert conditions. Explain " oasis," and say how an oasis originates.

THE RIVERS OF AFRICA

Africa has three great rivers—the Nile, the Congo, and the Niger. The Nile, which is the longest (3470 miles), and the Congo, which drains the greatest area, both rise in the eastern highlands of the Southern Plateau. The White Nile, the main stream of the Nile, has its source in the natural reservoirs of Lakes Victoria, Edward, and Albert, which are situated on the Equator, and therefore receive rain throughout the year. Their overflow carries the river northward across the Sahara Desert to its delta on the Mediterranean Sea. At Khartoum the White Nile is joined

by the Blue Nile, and above Berber by the Atbara, both of which rise in the highlands of Abyssinia. These tributaries are swollen in summer by the heavy rains of the Zanzibar Monsoon (Fig. 36); and their water causes the Nile to rise in June to its annual flood.

The **Congo** rises as the Lualaba near the southern end of the eastern highlands in a district of very heavy summer rain (Fig. 35), and is fed by many tributaries from near the Equator. Because of the westward slope of the Southern Plateau, the Congo flows to the Atlantic Ocean, cutting an outlet through the Plateau's western rim. Its basin contains 10,000 miles of navigable waterways—about half the mileage of the Amazon basin. The **Niger** (2600 miles) rises in the Futa Jallon highlands only 150 miles from the coast, and after a great curve northward through $7\frac{1}{2}^{\circ}$ of latitude enters the Gulf of Guinea by a wide delta, covered with mangrove swamps.

Until the end of the eighteenth century it was believed that the Nile rose in great lakes north of the "Mountains of the Moon" in Central Africa, and that the Senegal and Gambia rivers on the west coast were the mouths of the Niger. Mungo Park in 1796 reached the Niger from the Gambia, and discovered that it flowed eastwards, not westwards. It was not, however, till 1862-4 that Speke and Grant discovered that Lake Victoria was the source of the Nile, and Baker found its second source in Lake Albert. In 1874-7 Stanley identified the Lualaba as the headwaters of the Congo, and followed its course to the Atlantic. The discovery of Lake Ngami, and the exploration of Lakes Nyasa, Mweru, Bangweulu, and Tanganyika were the work of David Livingstone (1849-73), greatest of all African missionaries and travellers, who sought, by opening up commercial routes to the interior of the continent, to end the misery of the trade in slaves.

In South Africa the **Zambezi** (2200 miles) and the **Limpopo** flow to the Indian Ocean, while the **Orange River** rises in the Drakensbergs, 130 miles from the Indian Ocean, and drains to the Atlantic. There are also areas of internal

drainage, with no outlet to the ocean, of which the largest is the basin of **Lake Chad**.

African rivers have been of little value in the opening up of the continent from seaward because of their descent by falls or cataracts from the edges of the plateaus to the coast. A series of six cataracts interrupts shipping on the Nile between Aswan, 600 miles from the Mediterranean, and Khartoum. Navigation is possible for 1000 miles on the Congo below the Stanley Falls, but from Stanley Pool the river rushes down the western edge of the plateau, forming 32 rapids in 170 miles. Similarly, the Niger is navigable for 1000 miles above Ansongo, but there and again at Busa cataracts destroy its value as an outlet to the sea. The Zambezi is only navigable in the rainy season for 400 miles inland to the Kebrabasa Rapids, and 800 miles higher its course is again interrupted where the river drops 340 feet in the Victoria Falls. In South Africa the rivers are often raging torrents in the wet season, in the dry season a string of pools.

COMMUNICATIONS

This failure of the rivers to provide outlets to the sea is not the only hindrance to transport in Africa. Over great areas desert conditions still make the camel the ordinary means of travel, though the Sahara has been crossed by motor-cars with caterpillar tracks; and in many parts of Central Africa goods can only be carried by porters because the tsetse fly infects animals with disease. Many miles of railway have been constructed in the Atlas and the Union of South Africa, and elsewhere lines run inland from the coast to get above the falls that isolate the upper river navigation, or link together navigable portions of the rivers. The two main objects of railway-building have been to open up highland areas which are suitable for white colonists and to transport the minerals from mining districts, which also become centres of settlement. There are, however, in Africa, good opportunities for the newer forms of transport. Outside the tropical

forest much of the surface is smooth and grows only scanty scrub, so that roads for motor-cars are hardly necessary, and landing-grounds can easily be prepared for aeroplanes.

The **Suez Canal**, 100 miles in length from Port Said on the Mediterranean to Suez on the Red Sea, is used by shipping between Europe and the east coast of Africa, but its real value is that it shortens the voyage between Europe

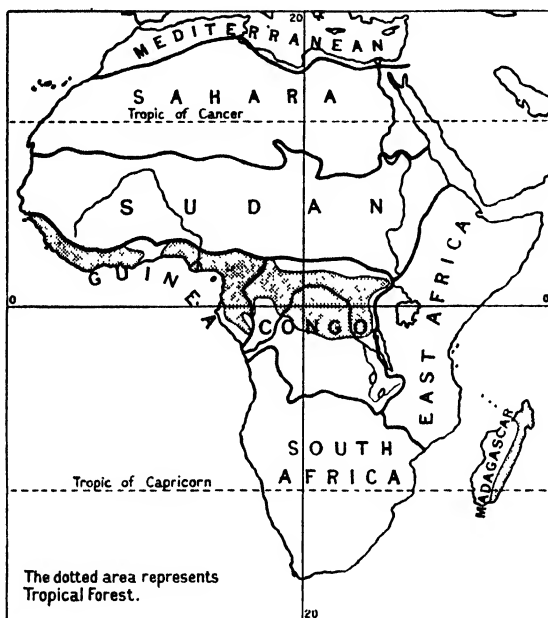


FIG. 37.—Africa : Natural Regions.

and India, the Far East, and Australia, compared with the Cape of Good Hope route.

NATURAL REGIONS

We can divide the continent (Fig. 37) into seven natural regions, as follows :

- (1) The Mediterranean Region, of winter rain and summer drought ;
- (2) The Sahara, which receives none of the summer monsoon rainfall ;

- (3) The Sudan, with a southern belt of Savanna, and a northern belt of Thorn Scrub ;
- (4) Guinea, that is, the coastlands of the Gulf of Guinea from the Gambia to the Congo ;
- (5) The Congo Basin ;
- (6) East Africa, including the Rift Valleys as far south as the Zambezi and the projecting Horn of Africa south of the Gulf of Aden ;
- (7) South Africa.

ISLANDS

Madagascar is the only large island, and there are few small islands owing to the plateau-formation of the continent. About 500 miles from Madagascar **Reunion** belongs to France, and **Mauritius** to Great Britain. Mauritius exports cane sugar to Britain, and is a port of call on the Cape route to India. Great Britain also holds **Sokotra**, 150 miles from Cape Guardafui at the tip of the Horn of Africa. Off the north-west coast of the continent the **Azores**, **Madeira**, and **Cape Verde Islands** belong to Portugal, and the **Canary Islands** to Spain. St. Vincent in the Cape Verde group is a fuelling port on the steamship track from New York to South Africa, while Las Palmas in the Canaries lies on the Great Circle route from the English Channel to South Africa. Madeira is near the Great Circle route from the Channel to Pernambuco in South America. These islands export bananas, tomatoes, and potatoes, and are coaling ports. **S. Thomé** and **Principe** (Portuguese) and **Fernando Po** in the Gulf of Guinea are producers of cocoa.

THE PEOPLES OF AFRICA

Africa is inhabited mainly by native peoples, who have been under European rule only for a hundred years or less, and for whose happiness and development their rulers are responsible. Egypt, Abyssinia, and Liberia are the three states that are not under European control.

The drought barrier of the Sahara and the mountains of

Abyssinia divide the peoples of northern Africa, who are **Hamites**, and belong to the white, or Caucasian, race, from those south of the Sahara, who are **Negroes**, and belong to the black race. The typical negro is black or dark brown coloured, with dark, tightly-curved hair, and has wider nostrils and more sweat-glands than white men, all of these characteristics fitting him for a hot, moist climate. Broadly speaking, the Hamites are keepers of cattle, or, in the Atlas Mountains, of sheep, though the Berbers of the Tell and the Egyptians are skilful agriculturists and gardeners. The "true Negroes," who live in the swamps and thick forests of the West African coast, are cultivators. The tropical forest of the Congo separates these "true Negroes" from the Bantu negroes of South and East Africa, who have, in a greater or less degree, come under the influence of the Hamites. The Bantu have therefore become chiefly cattle-keepers, though cultivating millet and maize by means of the hoe.

Changes have already been introduced by European influence; and agriculture is increasing at the expense of pasture. On the other hand, there are regions of poverty where even pasture is impossible. The veiled Tuareg of the Sahara are wandering camelmen; while the Bushmen of the dry Kalahari and the pygmy Negritos of the wet Congo forest are hunters and food-gatherers.

There are also differences in religion. In the seventh century A.D., Egypt and the Mediterranean lands of north Africa were overrun by fanatical Mohammedan Arabs, who, though relatively few in numbers, forced their language and religion on millions of their Berber subjects. Since then, Mohammedanism has spread south as far as the Congo forest, and down the east coast to Tanganyika. Christian missionaries, on the other hand, are educating and civilising pagan peoples of other parts of Africa.

About the same number of people live in Africa as in North America; but, as Africa is the larger continent, it has only 12 inhabitants for every square mile of its area as compared with 18 in North America. If you look at

Fig. 10 you will see that over most of the continent there are between 1 and 25 persons per square mile, that the desert areas are almost uninhabited, and that the Nile valley is the only district of really close settlement. There is moderately close settlement in Guinea, South Africa, the Atlas region, and certain areas in East Africa.

EXERCISES II

A

1. On a blank map (*a*) trace the courses of these rivers : Nile, Congo, Niger, Zambezi, Limpopo, Orange ; (*b*) Draw two lines to indicate the Rift Valley and sketch in and name the principal lakes of Africa ; (*c*) Name the principal islands round the coast of Africa.
2. In what month does the Nile overflow its banks ? Explain how this overflow occurs.
3. Explain : mangrove, cataract, Hamite, Bantu, delta.
4. Give the general characteristics of the Negro. In what parts has he become (*a*) a herdsman ; (*b*) a hunter ; (*c*) an agriculturist ?
5. Explain these phrases : (*a*) " The Dark Continent " ; (*b*) " The All-Red Route " ; (*c*) " Egypt is the Gift of the Nile."

B

1. On a blank map show in detail the course of the Nile and its tributaries, cataracts, and delta. Insert the names of the deserts on either side, and the towns on its banks.
2. Within what limits will the Congo be useful for navigation ? Compare it in this respect with the Nile.
3. Railway building has been difficult in Africa. Why ? For what particular purposes has it been successful ? What other methods of transport are employed ? Say in what parts of Africa.
4. Account for the small extent of Temperate Grassland in Africa compared with North and South America.
5. With what discoveries in Africa are these names connected : Speke, Vasco da Gama, Stanley, Baker, Mungo Park, Livingstone, Rhodes ?

THE UNION OF SOUTH AFRICA

The Portuguese discovered the Cape of Good Hope, but contented themselves with other ports of call, such as Benguella, Delagoa Bay, Zanzibar, and Mombasa, on their

new route to the Indies, and left it to the Dutch to make a permanent settlement in 1652 at Table Bay. The settlers found it necessary to spread inland, for in this dry neighbourhood 6000 acres became the usual size of a cattle ranch. They had crossed the Karroos and climbed the edge of the plateau when in 1814 Great Britain obtained possession of the colony. Henceforward there were two South African problems. One was British and Dutch rivalry. The other was whether South Africa was to be a white man's or a black man's country, because possession of the richer, better-watered lands in the east was disputed with the white cattle-farmers by Bantu cattle-farming tribes from north of the Zambezi.

In this struggle the white man has won. Native tribes, more or less independent under the control of the British Government, live in Basutoland, Swaziland, and British Bechuanaland; but in the Union of South Africa only one-eighth of the country may be owned by the natives, who form more than two-thirds of the population. For practical purposes, the Bantu has become the servant of the white man. Whether they live crowded in a native "reserve," as farm hands on the white man's farm, in a "compound" as labourers in his mines, or as workers in his towns, the natives are poor, uneducated, and backward; and South Africa cannot prosper until there are better conditions for the whole population, black as well as white.

To escape from British rule thousands of Dutch "Boers," or "farmers," crossed the Orange River between 1836 and 1840 in their ox-drawn wagons to the High Veld, where they formed two states—the Transvaal and the Orange Free State, with capitals at Pretoria and Bloemfontein. They were, however, cut off from the sea by the British occupation of Natal—the coastal plain east of the Drakensbergs. So long as they remained purely farming communities, the two Boer states might have continued their independent existence. In 1886, however, the discovery of goldfields at Johannesburg led to the construction of railways to that centre from Cape Town, Port Elizabeth

East London, Durban, and Lourenço Marques on Delagoa Bay. The goldfields also attracted large numbers of immigrants, of whom the majority were British. Disputes between Great Britain and the Transvaal as to the rights of these immigrants resulted in the conquest of the two Boer states by Great Britain, and their inclusion (1910) with the Cape of Good Hope Province and Natal in the Union of South Africa, in which the Dutch slightly outnumber the British. South Africa administers the mandated territory of South-West Africa (formerly German) under the control of the League of Nations.

SOUTH AFRICA : FARMING AND MINING

South Africa, which is eight times as large as England and Wales, is essentially a pastoral country, mainly devoted to the keeping of sheep and cattle. A line drawn from Mafeking to East London divides the eastern part of the country, which has 15 or more inches of summer rainfall (and therefore provides summer pasture, while winter food for stock is obtained from maize, millet, hay, and sun-flowers kept fresh in silos), from the western part which is practically desert. In the extreme south-west a small strip of country has about 20 inches winter rain ; while the coastal plain in the south and south-east has both summer and winter rain, amounting to more than 25 inches. In this last district are the best prospects for stock-raising, both for meat and dairy products. South Africa has as many **sheep** and produces nearly as much wool as Argentina. It has one-third as many cattle ; but little beef is exported, for the Boer humped cattle are bred chiefly for draught purposes.

The most important South African crop is **maize**, the main area of production being a triangle on the High Veld which has a hot summer and rain in heavy showers at short intervals (Fig. 38). The Winter Rain district supplies two-fifths of South Africa's wheat. The country's other leading crops are potatoes, oats, millet (Kaffir corn), barley, tobacco, and cotton. The coastal plain of Natal, wet and

hot because it is washed by the warm Mozambique Current (Fig. 35), grows **sugar cane** and manufactures sugar. Here also the black wattle tree has been introduced from Australia. The tannin yielded by its bark is used in the manufacture of leather from South Africa's large production of hides. This part of Natal contains many Indians, descendants of labourers brought from Asia to work on the sugar plantations. **Fruits** of various kinds thrive in nearly every part of the Union. The Cape Province, with its Winter Rain area, leads in most varieties, including the

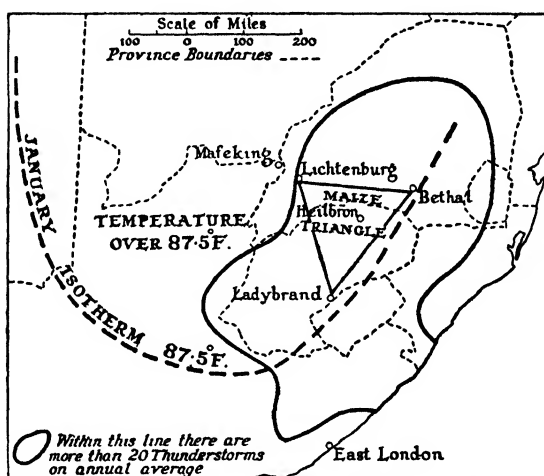


FIG. 38.—The "Maize Triangle."

vine, pears, and plums, but is second to the Transvaal in oranges and apples.

The mining industry gives to South Africa a degree of prosperity far greater than its pastoral and agricultural products could provide. The exports of gold and diamonds pay for two-thirds of the imports (mainly manufactured articles, such as clothing, cotton and woollen goods, machinery, vehicles, and food and drink). The **diamond-field** at **Kimberley** was so valuable that it began railway development in South Africa. Diamonds are also mined on the coast of South-West Africa. Half the world's **gold** is produced in the mines of **Johannesburg**; and cheap

AFRICA

power to drive the mining machinery is supplied. African coal, the largest **coal-fields** being those at Retief and Wakkerstroom in the Drakensbergs. Iron is worked in South-West Africa. Gold, diamonds, and copper make up more than half the exports of the Union.

SOUTH AFRICA : CITIES

Three-fifths of the trade of the Union is with Great Britain. **Cape Town** (149,000 ¹), the seat of the legislature, with a beautiful situation on Table Bay, is the chief port ; **Durban** (86,000) in Natal is second in tonnage ; while **Port Elizabeth** and **East London** are midway between these two ports. Towns have also sprung up far inland at **Kimberley** and **Johannesburg** (203,000), linked to each other and to the ports by railways. Johannesburg, which is the third largest city in Africa, would remain important as a market and industrial centre even if the gold mines should cease to exist. Round it cluster a number of smaller towns, including **Pretoria**, the administrative capital of the Union. Kimberley, without its diamond mines, would cease to exist. On the coast of South-West Africa there are ports at **Lüderitz**, **Swakopmund**, and Walvis Bay. South of the Tropic of Capricorn 1,827,000 whites live in the Union of South Africa.

SOUTHERN RHODESIA

North of the Tropic, as in Brazil, the height of the plateau gives a cooler climate than can be expected from latitude ; and here also, between the Limpopo and the Zambezi, conditions are favourable to white settlement. Salisbury in Southern Rhodesia is 1100 miles nearer the Equator than Cape Town, but has a mean annual temperature only 2° higher, because of its altitude of 4800 feet. The easiest line of approach to Rhodesia is from the south along the plateau. On the west, desert fringes the Atlantic

¹ All these figures for South African cities give the European population.

OUR WORLD TO-DAY

10° S. latitude. On the east the coast lands are moist, and the steep escarpment of the plateau has been climbed in order to reach the highlands.

The same motive that caused construction of the South African railways led to the settlement of Rhodesia by the British South Africa Company, for gold was known to exist, and had been worked in ancient times. Southern Rhodesia is to-day sixth amongst the gold-producing countries, the best mines being near Gwelo. Coal is mined at Wankie. The railway was extended from Kimberley to **Salisbury**, the capital, in 1902, and was carried across the Zambezi at the Victoria Falls.

In 1923 the territory of the British South Africa Company, called Rhodesia after Cecil Rhodes, its founder, was divided, Southern Rhodesia, south of the Zambezi, being separated from Northern Rhodesia, and becoming a self-governing colony, with an area equal to three times that of England and Wales. It contains a native population of about 1,000,000, a white population of 50,000. Half the land consists of high plateaus, along which runs the railway from Bulawayo through Gwelo to Salisbury; considerable tracts of hot, low-lying country are suitable only for native occupation. Large native "reserves" for tribal settlement are scattered throughout the colony. Agriculturally the country depends upon cattle (for markets in South Africa, Northern Rhodesia, and the Congo), maize, tobacco, cotton, and citrus fruits.

The Portuguese established ports of call on the eastern coast lands, from which they extended control inland over the territory of **Mozambique**.

BRITISH EAST AFRICA

Cecil Rhodes formed the idea of British territory continuous from south to north through Africa, to be bound together by a railway from the Cape to Cairo. In 1887 the Arab Sultan of Zanzibar granted to the British East Africa Company lands on the east coast which became the colony of Kenya. The protectorate of Zanzibar and also

Uganda, as part of the "hinterland" of this coast, later came under British control. A British protectorate was also established over Nyasaland, west and south of Lake Nyasa. After the Great War the former German territory of Tanganyika came under British administration under mandate from the League of Nations, linking Rhodesia and Nyasaland with Uganda and Kenya.

Colony.	Area (sq. miles).	Population (Native).	Population (White).	Capital.
Northern Rhodesia .	288,000	1,372,000	13,850	Livingstone.
Nyasaland .	37,500	1,498,000	1,910	Zomba.
Tanganyika .	374,000	5,022,000	8,230	Dar-es-Salaam
Kenya .	225,000	2,967,000	16,810	Nairobi.
Zanzibar .	1,000	235,000	280	Zanzibar.
Uganda .	94,000	3,536,000	2,000	Entebbe.
	1,019,500	14,630,000	43,080	

This huge area of tropical Africa has no more white inhabitants than many a market town in the British Isles. The Zambezi marks the limit north of which Central Africa, as a whole, ceases to be a white man's country. European settlement is confined to the highlands, of 4000 feet altitude, where British settlers have turned waste lands into thriving farms. Even there, farming is only possible with the help of native labourers. The native population, however, is also relatively sparse. The six colonies equal British India in area, but their population is only 5 per cent. as great. The tsetse fly infects human beings as well as domestic animals with disease, and in the whole continent probably half the African natives are weakened by malaria. Almost everywhere the demand for labour is greater than the supply.

The native who comes to work for six months with a white farmer learns improved methods of cultivation and stock-keeping, which he can apply at home. Unfortunately

at the same time he is cut adrift from the authority of the tribe, which formerly controlled his way of life. The task

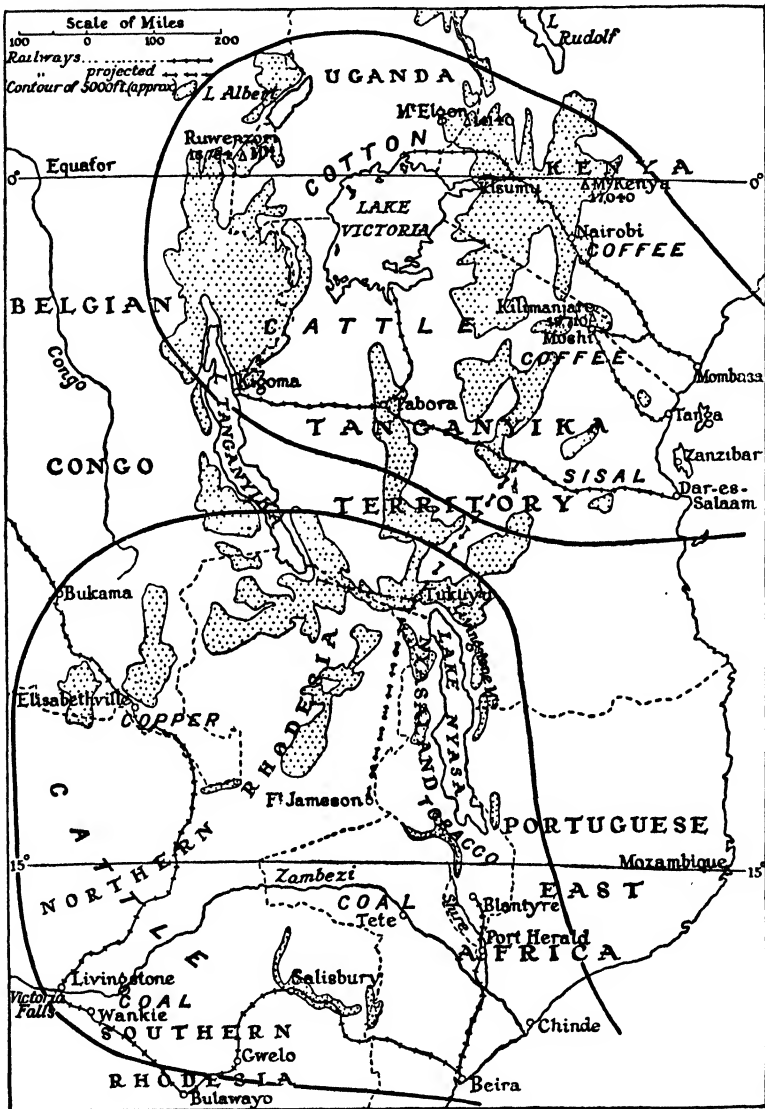


FIG. 39.—East Africa : Trade Basins.

of the British Government is to preserve and develop what is of value in native customs, and cause to work together

for the common good Europeans, Bantu, and Asiatics alike—for in Zanzibar there are many Arabs, and in Kenya twice as many Indians (artisans and traders) as whites.

These six states, along with northern Mozambique, fall into two trade basins (Fig. 39). The **Northern trade basin** is mainly the plateau country, 3000 to 5000 feet in height, with the lowland round Lake Victoria roughly in its centre. The eastern edge of the plateau is climbed by tentacle railways from Mombasa (Kilindini harbour), Tanga, and Dar-es-Salaam to Kampala, Moshi, and Kigoma. Millet and plantains are the food crops of Uganda, and **cotton** the main commercial crop, all being grown on native farms. In Kenya the care of flocks and herds is the most important native occupation. There are twice as many cattle, sheep, and goats in proportion to the population as in the United States. Maize is grown in the Rift Valley, wheat and barley on the plateau. **Coffee** and **sisal**, cultivated on the plantations of the European colonists, are the leading commercial crops and exports of both Kenya and Tanganyika. Most of the world's supply of cloves comes from the islands of Zanzibar and Pemba, the coco-nut industry ranking next in importance.

The **Southern trade basin** has outlet either at Chinde, by way of Lake Nyasa and the Shire and Zambezi rivers, or at Beira, both ports being in Portuguese territory. The hinterland of these ports extends inland nearly 1000 miles, and includes part of Southern Rhodesia and the Katanga mining district of the Congo. A white population has been brought into Northern Rhodesia by the development of **copper**, lead, and zinc mining, especially at Broken Hill, while there is a coal-field at Tete in Mozambique. Nyasaland grows tobacco and coffee, and Mozambique sugar cane.

ABYSSINIA (ETHIOPIA) AND THE HORN OF AFRICA

The northern portion of East Africa is the highland of Abyssinia and the lowland of the Horn of Africa. Abyssinia is largely a pastoral country, with a population of 10,000,000, which raises many cattle, sheep, and goats. Coffee is

the only crop grown at all extensively for export. The country has kept its independence largely through its mountainous character. It possesses no seaport, for European countries control the adjacent coasts of the Red Sea (Italian **Eritrea**, French **Somaliland**), the Gulf of Aden (**British Somaliland**), and the Indian Ocean (**Italian Somaliland**). A railway from Jibuti in French Somaliland to **Addis Ababa**, the Abyssinian capital, is the main trade outlet. Camel caravans bring goods to Berbera in British Somaliland, which exports hides and skins, gum and resins.

MADAGASCAR

The French colony of Madagascar is separated from the continent by the Mozambique Channel, which, at its narrowest, is 240 miles wide. It is a lofty plateau, 3000 to 5000 feet in altitude, with coastal plains on the east and west. The temperature of Antananarivo, the capital, situated on the plateau, is not much warmer than that of Naples in Italy, which is 22 degrees farther from the Equator. The eastern half of the island has rain throughout the year; the western half has summer rain only. Madagascar was probably originally populated by Polynesian or Malay peoples, who in very early times travelled from Sumatra and Java across the Indian Ocean in outrigger canoes. The chief crops are rice, manioc, and vanilla (on the eastern plain), sweet potatoes, and maize. Large herds of cattle and pigs are kept on the plateau. Graphite, used to make lead for pencils, is the chief mineral product.

EXERCISES III

A

1. On a blank map of South Africa mark and name: The four provinces with their capital towns; South-West Africa, Rhodesia, Basutoland, Swaziland, Bechuanaland, Pretoria, Durban, Port Elizabeth, East London, Kimberley, Walvis Bay, Salisbury, Bulawayo.
2. Name areas or towns in South Africa noted for the supply of: Copper, diamonds, coal, gold, wheat, maize, millet, oranges, vines, and sugar.

3. Find on your map these names : Addis Ababa, Zanzibar, Pemba, Mombasa, Dar-es-Salaam, Chinde, Beira, Gwelo, Wankie, Lourenço Marques.
4. Show on a map the boundaries between the six colonies mentioned on p. 157. Insert the names of the colonies and their chief towns.
5. Write these names over areas noted for the supply of : Ivory, cotton, coffee, cloves, coal, sisal, hides, tobacco.
6. Explain : Silo, veld, Boer, coolie, sisal.

B

1. Say why Rhodesia is so suitable for European settlement. What crops are grown in this State ?
2. Which is the least productive of the provinces of South Africa ? Say why.
3. Give reasons for the importance of : Beira, Cape Town, Johannesburg.
4. Trace the influence of geographical factors on the settlement of Europeans (*a*) at the Cape of Good Hope ; (*b*) in the Transvaal ; (*c*) in Southern Rhodesia.
5. Name the European nations which have possessions in Africa. Name these possessions.

THE CONGO BASIN

Stanley's exploration of the Congo led to the acquisition by Belgium of two-thirds of its drainage basin. The remainder is divided between French Equatorial Africa in the north, Portuguese Angola in the south-west, and British territory in the east and south-east. Tropical Forest covers the northern half of the basin (Fig. 37), this area yielding palm oil and palm kernels, rice, copal (a resin used for varnish), coffee, cacao, and rubber. Cotton is cultivated on the higher Welle district in the north-east. Ivory is obtained from the wild elephant herds ; and gold is mined at Kilo and Moto. The chief mineral district, however, is **Katanga** on the comparatively healthy upland rim of the basin in the south-east. One of the richest **copper-fields** in the world is that which includes Katanga and the adjacent part of Northern Rhodesia. From Katanga also comes **radium** ; while the Kasai area farther west has **diamond** mines as rich as those of South Africa.

The Congo and its tributaries are unsatisfactory as an outlet for this mineral wealth (p. 147), although railway links have been built to connect the navigable stretches which are interrupted by falls. From outside the Congo basin, therefore, railways have been built to connect the Katanga district with the sea : (1) from Pointe-Noire in French Equatorial Africa to Brazzaville on Stanley Pool ; (2) from Benguela in Angola to Bukama in Katanga ; (3)

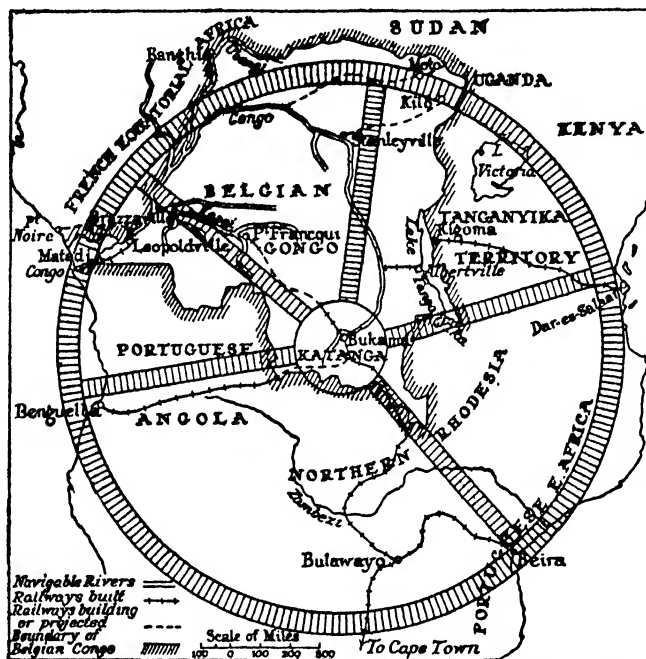


FIG. 40.—"The Wheel of Central Africa."

from Kigoma on Lake Tanganyika to Dar-es-Salaam ; (4) from Bulawayo in Southern Rhodesia to Bukama, to give an outlet at Beira. Thus Katanga has become the hub of a wheel of river and railway transport (Fig. 40).

COUNTRIES OF THE GUINEA COAST

If many native peoples of Africa are more backward than white peoples, it must be remembered that for centuries the white countries were interested in Africa south

of the Sahara only because it provided calling ports on the seaway to India and because it exported slaves. The shipment of slaves began on the Guinea coast, though later the whole continent between the Tropics was swept by Arab slave-traders.

About 1875 different European countries realised, as the result of the work of Livingstone, Stanley, and other explorers, that colonies in Africa would save the peoples of Africa from the slave-trader, supply tropical products, and purchase European goods. Germany took as "protectorates" Togoland and the Cameroons, which after the Great War were divided as "Mandate territories" between Great Britain and France. France extended its territory north-eastward from Brazzaville on Stanley Pool towards the tributaries of the Nile, and inland from trading posts on the Gulf of Guinea to Timbuktu on the northward bend of the Niger, whence for centuries caravans had brought ivory, gold, and slaves across the Sahara to the Mediterranean coast. French territory thus surrounds the colonies in West Africa, which Great Britain acquired by extending control inland from the "factories" established by trading companies at the mouth of the Gambia and on the Gold Coast (p. 67), and through the colonisation of Sierra Leone by freed slaves and of Nigeria by the National Africa Company. South of Sierra Leone is the small independent state of Liberia, founded as a home for freed negro slaves from the United States.

BRITISH WEST AFRICA

With the exception of Gambia, the West African colonies of Great Britain lie in the Tropical Forest belt, though the Gold Coast and Nigeria extend northward to include great areas of open grassland. Along with the mandated portions of Togoland and the Cameroons they cover about half the area of British East Africa (p. 157), but in half the area contain nearly twice the population. They are an important market for British goods, three-fifths of their imports (chiefly manufactured articles) coming from Great

Britain. Most of the natives grow crops for their own use and in addition produce some for sale.

Colony.	Area.	Population.	Capital.
Gambia . . .	4,130	200,000	Bathurst.
Sierra Leone . . .	31,000	1,770,000	Freetown.
Gold Coast . . .	78,800	3,121,000	Accra.
Togoland . . .	13,000	276,000	..
Nigeria . . .	372,840	20,762,000	Lagos.
Cameroons . . .	34,230	774,000	..
	534,000	26,903,000	

These colonies yield products which are typical of Tropical Forest regions. **Gambia**, which includes little more than the banks of the navigable portion of the lower Gambia River, ships little else than ground-nuts from the coaling port of Bathurst. The principal exports of **Sierra Leone** are kernels and oil from the oil palms of the Tropical Forest, nuts from the kola tree orchards that are found in every village, and ginger. Its capital, **Freetown**, is the greatest seaport in West Africa.

The prosperity of the **Gold Coast**, which is as large as England and Scotland combined, depends largely on **cocoa**, of which it produces two-fifths of the world's supply. The gold-bearing rocks, from which the colony has its name, are still mined, manganese and diamonds being other mineral products. The Volta, which drains the greater part of the colony, and other rivers of the Guinea Coast carry to the ocean enormous quantities of sand. This makes the coastal waters shallow, so that the waves break in line upon line of surf along the coast. At the ports of Accra and Sekondi goods can only be shipped or landed by means of surf boats, but a deep-water harbour has been built at Takoradi.

Nigeria, seven times the size of England, is next to India the most populous British dependency. In the south, which has a heavy rainfall throughout the year, and a very

moist atmosphere, it has a narrow belt of Tropical Forest. In the north, which is hot and dry except during the rainy summer, it has a much larger area of Savanna. The navigable section of the Niger below Busa and its tributary, the Benue, gives a Y-shaped framework of waterways. This is crossed by an inverted Y of railways, built inland from Lagos and Port Harcourt, and carried northwards to the walled town of Kano, which is the centre of a caravan trade from the Mediterranean coastlands and from Lake

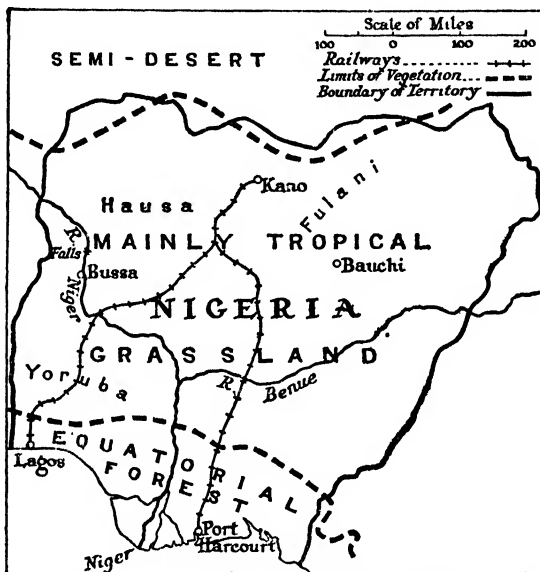


FIG. 41.—Nigeria : Vegetation, Peoples, and Communications.

Chad (Fig. 41). Motor roads act as “feeders” to the railways. The chief products of the forest belt of Nigeria are **palm oil and kernels**, cocoa, and mahogany. **Tin** is mined on the Bauchi Plateau, and coal for the railways at Enugu, while cotton is cultivated in the Savanna country.

EXERCISES IV

A

1. On the map of the Gulf of Guinea coast name the various states with their chief towns ; Lake Chad, Niger-Benue, Timbuktu, Busa, Kano.

2. Account for the importance of Katanga. Name the destination of each of the routes radiating from Katanga.
3. There are two vegetation belts in Nigeria. Name them and mention typical products.
4. Say what you know about : Radium, copal, mandate, ground-nuts.

B

1. Give what instances you can of the opening up of Africa by trading companies.
2. What parts of Africa are administered under mandates of the League of Nations, and by what countries ?
3. Compare British West Africa with British East Africa as regards (a) area ; (b) population ; (c) vegetation ; (d) products.

THE FRENCH AFRICAN EMPIRE

In 1830 French troops occupied Algiers, the stronghold of the Barbary pirates who had long been the terror of the Mediterranean. From Algeria French territory was gradually extended east into Tunisia, west into Morocco, and south across the desert to Timbuktu. Thus a solid block of French territory stretches from the Mediterranean to the Congo, occupying three-tenths of the continent, and containing one-quarter of its population. This French empire falls into three divisions: (1) The Atlas lands of **Algeria, Tunisia, and Morocco**, with the northern Sahara as far as the Ahaggar Plateau ; (2) **French West Africa**, with the mandated territory of Togo, including the Guinea Coast and the western Sudan as far as Lake Chad ; (3) **French Equatorial Africa**, with the mandated territory of the Cameroons, including the central Sudan and part of the Congo basin.

The **Atlas lands** yield such typically "Mediterranean" products as olive oil and wine (p. 144), and also exports to France large quantities of oranges, raisins, dates, new potatoes, artichokes, tomatoes, beans, and tobacco from the Tell coastal plain. In the higher Atlas lands, with a climate too harsh for such crops, their place is taken by wheat and barley. These higher lands also supply the whole requirements of France in sheep for mutton, though not for wool. In addition, Algeria and Tunisia mine much **iron ore**, and

Algeria, Morocco, and Tunisia supply nearly half the world's consumption of **phosphates**. Considerable quantities of zinc, lead, and other minerals are also produced. The chief cities in French North Africa are Algiers (257,000 pop.), Oran (163,000), and Tunis (202,000) on the Mediterranean coast, Constantine (104,000), Fez (107,000), and Marrakesh (193,000) inland, and Casablanca (161,000) on the Atlantic coast.

The Berbers of the Atlas lands belong to the white race (p. 150), and live under climatic conditions which are not very different from those of southern France. The French are able to look upon these countries as part of a greater France. They have brought peace and security, have introduced modern methods of administration which respect the beliefs and customs of the Berbers, and have greatly increased commercial prosperity. They have built 4000 miles of railway, dug hundreds of wells, and settled a considerable European population, between whom and the natives there is much more equality than exists between Europeans and Bantu in South Africa.

The resources of French Equatorial Africa, which is largely Tropical Forest, are undeveloped. French West Africa takes from France articles of food and drink, textiles, and mechanical implements, and exports fruits, ground-nuts, palm oil, rubber, cotton, cocoa, and timber.

The French hope to develop their whole African empire and to bind it together by building a railway across the Sahara from Oran or another Algerian port to Wagadugu, on which centre tentacle railways from the Guinea ports of Konakri, Grand Bassam, and Kotonu have already begun to converge.

LIBYA

Neither the Italian colonies of Eritrea and Somaliland (p. 160) nor that of **Libya**, on the Mediterranean coast of Africa, are of much value for European settlement. There is garden cultivation of date palms, olives, oranges, and other fruits, and of vegetables in the strip of Libyan coastland that has some winter rain (Fig. 35) ; but inland these

crops quickly give place to stunted shrubs, which in turn are succeeded by desert.

THE VALLEY OF THE NILE

The tropical rains that fill the lake reservoirs of the Nile stretch a blue ribbon of water through a region of uncertain rainfall in the Sudan and one of drought in the Sahara to the winter rains of its delta on the Mediterranean. In summer its tributaries from Abyssinia add to its volume the rains of the Zanzibar Monsoon, making the river overflow its banks on either side to a width which varies from 2 to 30 miles. When the flood goes down, the water leaves behind a layer of fertile soil, on which the cultivator, without ploughing, can sow his seed ; while by dykes and ditches the flood-water with its enriching mud can be held up and led farther afield than the actual flood-plain. Alongside the edges of the blue ribbon are green ribbons of cultivation. From Uganda as far north as the Second Cataract the Nile flows through the **Anglo-Egyptian Sudan**. Between the Second Cataract and the head of its delta it has cut its bed deep into the rock surface of **Upper Egypt** ; below Cairo for thousands of years the river has been building the mud of its delta out into the Mediterranean Sea as **Lower Egypt**.

(a) **Egypt**. Wheat and barley have been grown in Egypt from very early times (p. 31), for the Nile mud yields crops when cultivated with primitive implements. Because the prevailing winds are northerly for nine months in the year, vessels can voyage up-Nile under sail and return with the stream. This made communication easy, and allowed the establishment of a central government, which could control the fair distribution of water by the irrigation canals. In the third place, as only the delta receives winter rain, Egypt has, on east and west, deserts which are difficult for invaders to cross. These factors made possible peace and good government, and the production of more than the bare necessities of life, so that thousands of years ago Egypt became a civilised country.

Reliance for water on the Nile flood, however, permitted of only one crop in the year. In 1882 Great Britain landed troops in Egypt to protect Europeans, and set about improving conditions in that country. The skill of British engineers, through the construction of dams and reservoirs on the Nile, has greatly increased the supply of water for irrigation. The greatest of these reservoirs is that of Aswan, just below the First Cataract. Through sluices the silt-laden flood water is allowed to flow from June to December, after which the normal flow from Lake Victoria is held up, and stored for use in spring. Besides increasing the agricultural acreage, these reservoirs make cultivation possible throughout the year, so that two or three crops can be raised on land that formerly yielded one.

In particular, this system permits the cultivation of **cotton**, the principal crop of Egypt, which yields about 6 per cent. of the world's supply. The warm climate, continual sunshine, and fertile soil produce a strong, silky fibre, used for the finest manufactured goods. Egypt has a population of 14,217,000 (equal to that of all British East Africa), which means 1000 persons to every square mile that is neither rock nor sandy desert. The country has therefore to raise much food to feed its inhabitants. The principal summer crops, in addition to cotton, are rice, sugar cane, and maize ; those of winter are wheat, barley, beans, lentils, onions, and clover (for fodder). The water buffalo is the draught animal of agriculture.

At the head of the Nile delta, and thus controlling both Upper and Lower Egypt, was situated Memphis, a capital of Egypt in ancient times. When the Arabs conquered Egypt, they created a new capital at Cairo, which like Memphis stands at the head of the delta, but was built on the east instead of on the west bank of the Nile, so as not to be cut off in time of flood from Medina, in Arabia, the capital of their empire. Its position makes **Cairo** (1,064,000 pop.) the route and trade centre of the country, and the largest city in Africa. It has connection by rail and canal with **Alexandria** (573,000), the chief seaport.

situated west of the Nile delta on the Mediterranean. Other ports are **Port Said** (104,000) and **Suez**, at the north and south ends respectively of the Suez Canal.

(b) **Anglo-Egyptian Sudan.** The prosperity of Egypt depends upon the flood-water of the Nile. When, therefore, the upper course of the river came under the control of savage nomad Arabs, the Sudan was conquered by British and Egyptian troops ; and the two countries share in its administration. The Sudan has an area of 1,000,000 square miles, with a population of 5,005,000. The largest towns are **Omdurman** (103,000) and **Khartoum**, situated close together at the junction of the White and Blue Niles. The Sudan, in addition to exporting through Alexandria, has ports at Suakin and Port Sudan on the Red Sea.

The food crop of the Sudanese is millet, and they own herds of cattle, sheep, camels, donkeys, and goats. The commercial crop is **cotton**, grown on the rich alluvial soil between the two Niles with irrigation water from the Sennar reservoir on the Blue Nile. It is proposed to construct a reservoir on the White Nile at Jebel Auliya, to increase the allowance of water to Egypt after the time of flood. The creation of a great reservoir has also been suggested at Lake Tana, the source of the Blue Nile in Abyssinia, to increase the irrigation water for both Egypt and the Sudan.

EXERCISES V

A

1. On a map of Africa shade those parts which belong to, or are governed by, the British Empire.
2. Name products typical of (a) Algeria ; (b) Togo ; (c) Libya ; (d) French Equatorial Africa. What mineral resources have the French possessions of Northern Africa ?
3. Through which states does the Nile flow ? Name typical products of (a) the Upper Valley ; (b) the Lower Valley.

B

1. Illustrate from Egypt how man has overcome the drawbacks of Nature.
2. Write a note on the position of : Cairo, Khartoum, Port Said.

CHAPTER VII

AUSTRALIA, NEW ZEALAND, AND THE PACIFIC ISLANDS

AUSTRALIA

DISCOVERY AND ANNEXATION

EARLY in the seventeenth century the Dutch established themselves in Java to control trade between Europe and the East Indies; and Dutch seamen from Java explored the north and west coasts of Australia. Tasman, best known of these Dutch captains, in 1642 sailed south of Tasmania, making it clear that Australia did not, as had been thought, form part of a continent lying round the South Pole; and then, navigating eastward, discovered New Zealand. More than a century later Cook sailed round New Zealand, and on his voyage home passed up the eastern coast of Australia (1770), taking possession of it for Great Britain.

POSITION AND STRUCTURE

Australia is the most isolated of all the continents, and was the last to be colonised by Europeans. In area it is the smallest continent, though it is roughly equal to the United States, and forms one-fifth of the British Empire. It lies south-east of the Old World, connected to Asia by the partly submerged mountain chains of the Eastern Archipelago.

Australia extends through about 40° of longitude and 30° of latitude, and is approximately rectangular in shape, except that its north and south coasts curve towards the north. It has no active volcanoes or snow-capped mountains; and its loftiest summits, Mts. Kosciuszko (7328 feet)

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and Townsend (7260) in the Eastern Highlands, are much lower than those of the other continents. It is a relatively low plateau (only a small area rising above 2000 feet in height), with an almost unbroken coast-line, a low-lying, well-watered coast, and a depressed, generally arid, interior. The continent is separated from New Guinea in the north by Torres Strait, and from Tasmania in the south by Bass Strait.

PHYSICAL DIVISIONS

Australia may be divided into four regions (Fig. 42).

(1) The **Eastern Highlands** stretch from Cape York to

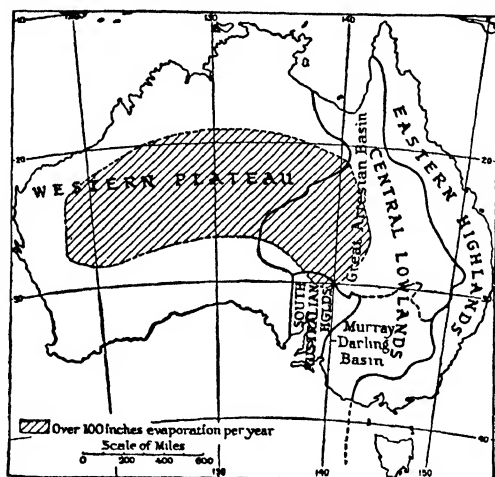


FIG. 42.—Regions of Australia.

Tasmania, with an average height of 2500 feet, and a width varying from 30 to 300 miles. They slope gradually to the west, steeply to the eastern coast plain, which has been narrowed by the submersion beneath the sea of part of the plateau. Upon this submerged plateau has been built up the coral of the Great Barrier Reef, 1250 miles long. The shelter given by the Reef affords a sea passage, "Australia's Grand Canal," much used by vessels trading from eastern Australia with India, China, and Japan.

In New South Wales the Highlands are divided by

cols into the New England Mountains, the Blue Mountains, and the Australian Alps, each over 3000 feet in height.

(2) The **Central Lowlands** lie between the Eastern Highlands and the Western Plateau. Their northern portion forms the **Great Artesian Basin**. A great gulf once extended from the Gulf of Carpentaria to Lake Eyre. In this clay-bottomed sea were deposited beds of sand, which ultimately became a permeable sandstone. This sandstone was covered in turn by impermeable clays. Later, the whole area was raised by earth movements ; and round its margins the upper clays were stripped off by erosion, leaving the sandstones exposed. Rain falling on these exposed marginal sandstones is absorbed, flows underground instead of as surface drainage, and collects on the old floor of the clay-bottomed sea. This underground water is forced to the surface, or can be pumped up, where a boring reaches it through the overlying clays and sands. Over 3000 such " Flowing Wells " are in existence in Queensland alone, yielding nearly 300,000,000 gallons of water daily. The western portion of the Great Artesian Basin includes an area of internal drainage containing the salt Lake Eyre, into which the Diamantina and other rivers discharge, but only when flooded by the heavy summer rainfall of the monsoon region in the north.

Smaller Artesian Basins supply Victoria, Western Australia, and parts of South Australia and New South Wales.

The southern portion of the Central Lowlands is the **Murray-Darling Basin**. The upper waters of the Murray really constitute three separate rivers—the Darling, Murrumbidgee, and Upper Murray, all rising in the Eastern Highlands near the Pacific, and flowing away from it. The Murray and Murrumbidgee are the only Australian rivers that are not entirely dependent on rainfall, instead of on springs or snowfields. All other rivers are liable to flood after rain, and shrink during drought, in many cases to a string of pools. In good seasons 2500 miles of the Murray and its tributaries are navigable ; but the

whole system enters the sea by an outlet so shallow that only the smallest steamers can cross its bar. Between the Lower Lachlan and the Murray are the flat Riverina plains, with very fertile soil.

(3) The **South Australian Highlands** are an isolated series of ranges separated by plains, with a north-south direction. Parallel to the Highlands on the west the "Rift Valley of Australia" extends from Lake Torrens through Spencer Gulf to St. Vincent Gulf. On the east the Highlands sink to a plateau of old rocks, which contains rich metal-bearing deposits, notably at Broken Hill (New South Wales), the chief centre of lead and silver production in Australia.

(4) The **Western Plateau**, lying roughly west of a line joining the Gulfs of Spencer and Carpentaria, comprises over half of the continent, and has a general elevation of from 1000 to 1500 feet.

CLIMATE

The Australian continent is situated in much the same latitudes as Africa south of Lake Tanganyika, that is, mainly in the Torrid Zone. As, however, it extends farther south, a larger area than in Africa lies in the South Warm Temperate Region, while Tasmania is in the South Cool Temperate Region (Fig. 4).

The low average elevation of Australia (probably under 1000 feet) should naturally tend to give the continent a fairly uniform climate. In actual fact there is a marked difference between the coastlands and the interior.

Its regularity of outline means that there are few great inlets to carry the climatic influence of the ocean inland, such as there are being either narrow, like Spencer Gulf, or so situated, like the Gulf of Carpentaria, that they affect only a small area. Further, over much of the continent the rain-bringing winds are the **South-east Trades**, blowing either throughout the year or during the southern summer. As the highest land lies near the east coast, the Trades deposit their moisture before they cross it, and,

once arrived inland, have no other elevation to encounter, and so to cause production of further rain. The fierce rays of the sun beat on the almost level surface of the interior of the continent, so that the "possible" evaporation (Fig. 42) generally exceeds the actual rainfall. In the drier areas, therefore, water has to be preserved in artificial reservoirs, called "tanks." Nature has placed Australia just where Trade Wind desert can occupy the largest portion of its surface, and made it **the hot, dry continent.**

The two projecting areas of Western Australia and

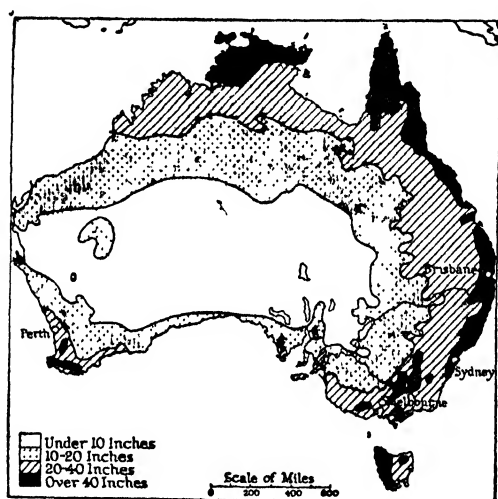


FIG. 43.—Australia : Annual Rainfall.

South Australia (Victoria) on either side of the Great Australian Bight have summer drought from the **Trade Winds** and winter rain from the **Westerlies** ; but, as shown by the 10-inch isohyet (Fig. 43), these rains die off fairly near the coast. Tasmania lies throughout the year in the belt of the **Westerlies**, and its mountainous western half receives such a heavy rainfall (in places over 100 inches) as to render it practically uninhabited.

The north of Australia receives **monsoon** rainfall. In January (southern summer) the interior of the continent heats up, and warms the air in contact with it, so that an

area of low atmospheric pressure is formed. Towards this air currents flow from over the seas north and north-east of Australia, bringing rain to the north of the continent and to the east coast as far south as Brisbane. The heat of the interior, however, is so great that even this rainfall does not penetrate inland to the heart of the country. Through one cause or another, 70 per cent. of Australia receives only 20 inches rainfall or less in the year, and half the continent has no rain for six months in the year.

VEGETATION AND ANIMALS

Tropical Forest occurs on the east coast south of Cape York peninsula and covers the Eastern Highlands to about 500 miles south of the Tropic of Capricorn; **Temperate Forest** is found in Tasmania. Elsewhere vegetation is of a kind that is specially adapted to resist drought. The southern portion of the Highlands is thickly forested with trees of the eucalyptus type (also called gum trees because of the resin in their bark), that have leathery leaves which they turn edge-on to the sun. These are more thinly spread inland over the **Savanna** lands north of the Tropic and the **Temperate Grasslands** south of the Tropic, in parts of which the dwarf eucalyptus (mallee) appears.

The eucalyptus is generally replaced by one species or another of acacia (mulga, mimosa, or wattle, etc.) as the rainfall becomes less and less towards the western and central **Deserts**, where 500,000 square miles are covered by sand dunes, bound together by clumps of the tussock grass called spinifex. In these dry lands of Australia no white man lives and no stock can find pasture.

The birds and animals of Australia and the neighbouring islands are notably different from those of India and the Malay Peninsula, the line of division being shown by A. R. Wallace to pass between the two small islands of Bali and Lombok. Australia has no woodpeckers, pheasants, apes, baboons, or monkeys, and no ruminant animals. On the other hand, the number of species of marsupials, or "pouch-bearers," of the type of the kangaroo, is unequalled any-

where else on the globe. Bird-families found only in the Australian region include the birds-of-paradise, lyre-birds, emu, and cassowary.

THE SETTLEMENT OF AUSTRALIA

The Dutch made no attempts to colonise Australia, largely because it was the driest parts of coast that lay nearest their settlements in Java. Cook, on the other hand, discovered the well-watered east coast ; and there, in 1788, settlement was made, first at Botany Bay, but soon afterwards on the site of Sydney, at Port Jackson, on the magnificent harbour formed by a " drowned " river valley. The position of these colonists, on a coast plain backed by lofty mountains, was similar to that of the early settlers in the United States, though the Australian " black fellows " were fewer in numbers and less dangerous than the American " redskins." In 1803 Captain M'Arthur commenced the breeding of fine wool sheep ; and in 1813 a search for fresh pastures, made urgent by drought, led to the discovery of a pass over the Eastern Highlands. It was then found that their drier western slopes were better adapted than the coastlands to the cultivation of wheat. The original settlement at Sydney thus grew into the state of **New South Wales**.

Other attractive coastal districts were quickly brought into occupation. **Tasmania** was annexed ; and from Tasmania flock owners crossed to the mainland about Port Phillip, thus laying the foundations of **Victoria**. From Sydney settlements were made on the Swan River and at Moreton Bay, thus originating the states of **Western Australia** and **Queensland** ; while immigrants from Great Britain founded **South Australia** on the Adelaide Plains. These six colonies united in 1901 as the Commonwealth of Australia. The **Northern Territory**, between Queensland and Western Australia, is administered by the Commonwealth Government, while a small area of Federal territory lies round the capital, Canberra.

The new settlements on the coast were separated by dry

lands in the interior. Many expeditions, such as those of Eyre and Stuart, searched for routes to connect them. There was a demand for fresh sheep pastures, which led to explorations that brought knowledge, for instance, of the Murray-Darling basin. By 1862 Australia had become fairly well known, save in the far north and the western and central deserts, which remain empty lands to-day.

In the east and south—on 46 per cent. of the continent's area—lives practically the whole population of 6,500,000, nearly half this total being in the capital cities of the different states. West of Queensland and New South Wales, and north of the isohyet of 10 inches rainfall, 54 per cent. of the area is virtually without inhabitants (Fig. 10).

EXERCISES I

A

1. On a blank map of Australia mark and name: Pacific Ocean, Gulf of Carpentaria, Torres Strait, Bass Strait, Great Australian Bight, Spencer Gulf, St. Vincent Gulf, New Guinea, Tasmania, Albany Range, Flinders Range, Mount Kosciusko, Great Barrier Reef, Lake Eyre.
2. Make a sketch of the Murray-Murrumbidgee-Lachlan-Darling river system.
3. Explain these terms: archipelago, artesian well, coral, isohyet, marsupial, spinifex, acacia, mallee.
4. Name (a) some distinctive animals, (b) some distinctive plants of Australia.
5. Explain why: (a) the interior of Australia is hot and dry; (b) the rivers are of little use for navigation; (c) the heaviest rainfall is in the north; (d) the gum tree is suited to a dry climate.

B

1. In what part of Australia is the population (a) dense, (b) moderate, and (c) scanty? Show how the climate has influenced this distribution.
2. Why was Australia so long in being colonised? In what part did immigrants first settle? What caused hindered the extension of the settlement area?
3. Make out a table with three columns, for Continents, highest mountains and their heights, longest rivers and their lengths; and compare Australia with the other Continents.

4. Compare the methods of irrigation in the Central Lowlands of Australia with those practised in the Nile valley.
5. Search out more information than is given in the text about the explorers mentioned.

PASTORAL INDUSTRIES

(a) **Sheep.** The large proportion of the area of the continent which receives less than 20 inches rainfall makes Australia as a whole better suited for pastoral than for agricultural industries. The chief factor in the country's

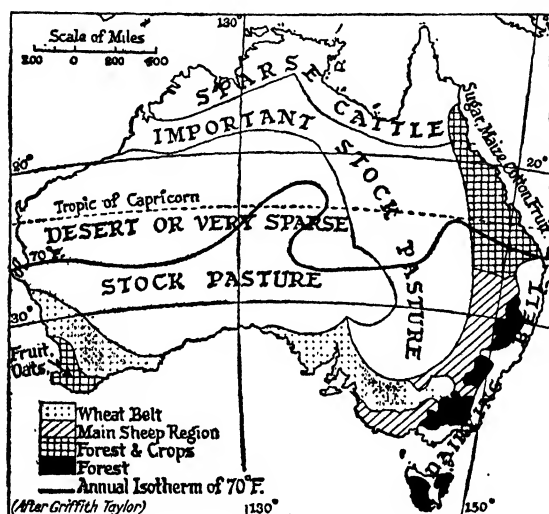


FIG. 44.—Agricultural Regions of Australia.

pastoral wealth is wool. Australia produces a quarter of the world's wool, most of the clip being fine quality merino wool. Great Britain buys one-third of the wool exported, France and Japan being the next largest purchasers; and Great Britain takes nearly 90 per cent. of the country's exports of frozen mutton and lamb. The main sheep belt lies in the wetter farmlands of New South Wales (on the Eastern Highlands and their western slopes and the Riverina) and in central and south Victoria (Fig. 44). Other good sheep districts are (1) the middle of the Artesian

Basin in Queensland ; (2) the southern portion of the South Australian Highlands ; and (3) Tasmania. Sheep farms are large, and modern machinery is used for shearing and other purposes.

(b) **Cattle.** Great Britain is the largest buyer of Australian beef, taking half the total shipments, which exceed in value those of mutton and lamb. There is also a developing dairy industry, which supplies the requirements of the towns, and also exports butter and cheese. The average Australian eats nearly twice as much butter as the average Briton. The chief dairying districts are along or near the coasts of New South Wales and Victoria, where there are a mild climate and a reliable rainfall that keep the vegetation green all the year round. Maize is grown to supply additional cattle food, and also to feed pigs. More than half the beef-cattle in Australia are in Queensland ; and the finest animals are raised on the tropical grasslands of that state, of the Northern Territory, and of Western Australia.

AGRICULTURAL INDUSTRIES

(a) **Cereals.** The acreage under crops in Australia is only one-third of that in Canada. **Wheat** is by far the most important crop, and occupies nearly three-quarters of the cultivated lands. Australia ranks fourth amongst the wheat-exporting countries (Fig. 7) ; and vast areas suitable for this cereal have not yet been developed. Heavy production takes place in districts with a rainfall of 25 inches and under (mainly in winter), which are rather too dry for sheep (Fig. 44), and which are within 20 miles of a railway. As in the United States (p. 116), wheat cultivation is extending into dry " mallee " country, which was considered unsuitable until new varieties of wheat were bred, suited to dry conditions, and until special implements were invented, such as the stump-jack plough, for working in ground uncleared of tree-stumps.

Hay and **oats** cover the largest acreages after wheat. Maize is grown, but the crop is not nearly so important

as it is in similar latitudes in South Africa, Argentina, and the United States.

(b) **Tropical and sub-tropical crops** are raised chiefly in Queensland. **Sugar cane** plantations extend down the east coast to south of Brisbane in the belt of more than 40 inches rainfall (Figs. 43, 44). This industry is specially interesting, because only in Queensland are tropical crops grown by white farmers on moist lowlands so near the Equator, where the mean temperature is over 75° F. Australians are determined to keep their land a "White Australia," and do not allow the immigration of "coloured" labourers to cultivate tropical crops. **Cotton** also is cultivated in Queensland (for local spinning) between Rockhampton and Brisbane in areas a good deal drier than those used in the United States, the better lands being under sugar. The same state also grows **bananas** and **pineapples**.

(c) **Irrigation and Fruit.** Under much the same conditions as those of the western irrigation areas of the United States (p. 115), reservoirs to supply water to cultivators are being built in districts that formerly supported only sheep. The largest completed reservoirs are at the Burrinjuck Dam on the Murrumbidgee (New South Wales), and at the Goulburn Dam in Victoria. A larger reservoir is under construction at Hume on the Murray. On such irrigated lands Victoria raises nearly 60 per cent. of its fruit crop, and New South Wales and Victoria each raise about 30 per cent. **Apples** and **oranges** are the most important Australian fruits—the largest acreage under apples being in Victoria, Tasmania, and New South Wales; that under oranges, in New South Wales. Other Australian fruits are peaches and nectarines, pears and plums. South Australia and Victoria, in the "Mediterranean" climatic region, grow **grapes** for the making of wines and for drying as raisins and currants.

MINERALS

The settlement of Australia would have been slow had it depended upon stock-raising and agriculture. In 1851,

however, gold was discovered near Bathurst (New South Wales) and at Ballarat and Bendigo (Victoria). This brought about a rush of immigrants, which was repeated when the Western Australian goldfields were discovered in 1883. Between 1850 and 1890 the population increased from 405,000 to 3,151,000. To-day the value of mining products is only about one-fifth of that from the pastoral industries. The most valuable minerals are **coal**, the richest coal-fields lying on the eastern flank of the Eastern Highlands in New South Wales and Queensland, **lead** from Broken Hill (p. 174), **gold** from Kalgoorlie and other goldfields widely distributed over the west half of Western Australia, and **copper**, chiefly from Tasmania and Queensland.

INDUSTRIES AND CITIES

Manufacturing industry in Australia is concerned chiefly with essential public services (such as the production of heat, light, and power), the preparation of food and drink from the agricultural and pastoral production of the country (dairying, flour-milling, meat-preserving, etc.), metal works and machinery (engineering, metal extraction, railway works), and certain other industries which utilise raw materials chiefly of Australian origin (such as tanneries, saw mills, clothing factories, printing works). Such industries tend to concentrate in the capital city of each state, and thus to swell its population.

The capital of Australia is **Canberra**, situated in the upper Murrumbidgee valley in the Australian Alps. The largest city is **Sydney**, the capital city of New South Wales (1,253,000 pop.), which possesses a magnificent harbour, placed centrally on the coast of its state, and nearer than any other Australian port to the commercial centres of New Zealand. It is the best terminus for American traffic, and lies on the great ocean highway between Melbourne and the Far East. It is also centre of a semicircle touching three important coal-fields. **Newcastle** (104,000), on a coal-field north of Sydney, has better natural communication

than that city with the Central Lowlands by the Cassilis Gate pass between the New England and the Blue mountains, but this route has never been utilised for a railway.

Melbourne, capital of Victoria (1,032,000), is at the northern end of the great harbour of Port Phillip; **Adelaide**, capital of South Australia (324,000), is near the east side of St. Vincent Gulf; and **Brisbane**, capital of Queensland (313,000), stands at the head of navigation on the Brisbane River, 500 miles north of Sydney as Melbourne is 500 miles south-west. **Hobart** (58,000), in Tasmania, has a deep, sheltered, and roomy harbour on the estuary of the Derwent.

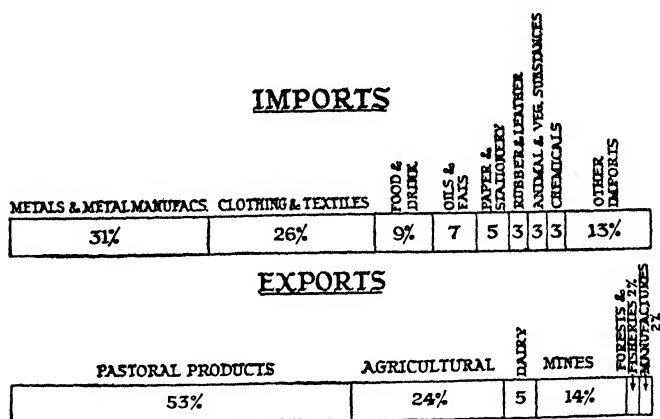


FIG. 45.—Trade of Australia.

Perth, in Western Australia (204,000), is the only state capital that is not also a seaport. It lies 12 miles up-river from its port, Fremantle, the western terminus of trans-continental railway communication with the ports on the east coast.

Lesser centres have developed as wool markets, such as Bourke on the Darling, and Bathurst (formerly a gold-mining town); as mining towns, such as Broken Hill and Ipswich in Queensland (coal); or as ports, such as Geelong on Port Phillip (wool and wheat exports), Port Pirie on Spencer Gulf (the port for Broken Hill), Rockhampton, and Townsville (Queensland).

COMMUNICATION AND TRADE

A fairly close rail-net serves the three south-eastern states, and a Trans-Australian line links Port Augusta on Spencer Gulf to Kalgoorlie, across the dry Nullarbor Plain. Elsewhere railways largely stretch inland from the ports. Increasing use is being made of motor and aeroplane transport ; it is intended to extend the air route between Great Britain and India to Singapore and Australia. Sydney, Melbourne, Adelaide, and Newcastle are the leading sea-ports. Nearly half the trade of the Commonwealth is with Great Britain, and 10 per cent. with other countries of the British Empire. Fig. 45 shows the nature of the exports and imports.

NEW GUINEA

Australia administers the eastern half of the large island of New Guinea—the southern portion (Papua) as a possession, the northern portion, with the Bismarck Archipelago, New Ireland, and the Solomon Islands, under mandate from the League of Nations. The western half of New Guinea forms part of the Dutch East Indies. The native population of Australian New Guinea numbers about 700,000. New Guinea has a moist tropical climate and great natural resources, agricultural and possibly mineral, as yet practically undeveloped. Copra is the chief export, and Port Moresby the only town of importance.

EXERCISES II

A

1. On a blank map enter these names : The six states of Australia ; the Capital town of each ; Canberra, Ports Phillip, Jackson, and Pirie ; Fremantle, Newcastle, Geelong, Bendigo, Ballarat, Darwin, Broken Hill.
2. Name areas or towns noted for the supply of : Gum, gold, silver, apples, cotton, copper, grapes, sugar, coal, woollen goods. Name four products not already mentioned.
3. " Climatic factors have decided that Australia shall be primarily a pastoral country." Explain this statement. Do you agree with it ?

4. State the various means used to overcome lack of sufficient rainfall in Australia. Mention areas in which the different means are adopted.

B

1. What is meant by the " White Australia Policy " ?
2. Give the geographical or other reasons which led to the growth of Sydney, Melbourne, Hobart, Fremantle, Newcastle, Rockhampton.
3. Where else, besides Australia, has the discovery of minerals led to the growth of centres of population, thus creating markets for agricultural products ?
4. Give a short account of Tasmania under (a) Relief ; (b) Climate ; (c) Occupations ; (d) Exports.

NEW ZEALAND

POSITION OF NEW ZEALAND

The western coast-line of the Pacific Ocean, like its eastern coast-line in the two Americas, is bordered by folded mountain chains, amongst which volcanic upheavals have taken—and still take—place. In this part of the ocean, however, these marginal chains appear as island festoons instead of as continental cordillera. Their course runs northward through New Zealand to the Fiji Islands, turns westward to New Guinea, and then strikes northward again through the Philippines to Japan and Kamchatka peninsula.

Two large islands (the North and the South Islands) and numerous smaller islands form the Dominion of New Zealand. The Dominion possesses several isolated island groups, and administers the Ross Dependency in Antarctica and (under the League of Nations' mandate) Western Samoa. The two main islands are situated in the middle of the water hemisphere of the globe, 1200 miles south-east of Australia. They lie between latitudes similar to those of the western coastlands of Europe and Africa from Lorient (France) to Rabat (Morocco), with which lands they could directly connect if it were possible to travel straight through the centre of the earth. The North Island is considerably

larger than Ireland ; the South Island has almost exactly the same area as England and Wales. The two islands are separated by Cook Strait.

RELIEF AND COASTS

The backbone of New Zealand is a chain of folded mountains. This is most marked in the South Island, where it is known as the Southern Alps, and rises to an average elevation of 8000 feet, and in **Mount Cook** to 12,350 feet. In the north-east of the island the Kaikoura range branches off from the Alps, and continues as the main chain of the North Island between Cook Strait and Cape Runaway. This North Island chain seldom exceeds 6000 feet in height ; it is broken up by river valleys into the Tararua, Ruahine, and other ranges. The centre of the North Island is occupied by the almost barren, pumice-covered Volcanic Plateau, in the midst of which lies Lake Taupo, drained by the **Waikato** River. Around it are high ranges and volcanic peaks, such as Ruapehu (9175 feet). The beautiful cone of Mount Egmont (8260 feet) rises in the south-west on the coast. The largest area of plain is the Canterbury Plains on the east side of the South Island, 150 miles long, and, on an average, 20 miles wide.

On both the east and west coasts the swell of the ocean, driven by the prevalent south-west winds, deposits sand and gravel as bars at the mouths of the rivers, so that there are no good natural harbours on the west coast, and on the east coast only where projecting promontories give shelter, as at the Otago and Banks Peninsulas. Harbours that are secure, whatever the tide and weather, can be found only where there is protection from the west winds and the ocean swell, that is, on the north coast, in the south-western fiords of the South Island, and on Cook Strait.

CLIMATE AND NATURAL VEGETATION

New Zealand stretches through 900 miles of latitude, the South Island and most of the North Island being

situated in the South Cool Temperate Region, while the rest of the North Island is in the Warm Temperate Region (Fig. 4). The effect of its position in the midst of a great ocean is to reduce the changes of temperature between season and season, the maximum and minimum mean temperatures at Dunedin (South Island) being respectively 57.9° F. and 43.6° F., which are very nearly the same as those of Kew, near London. Those of Warm Temperate Auckland are 65.5° F. and 52.9° F.

Most of the Dominion lies within the belt of prevailing Westerly Winds, and thus receives cyclonic rain throughout the year. North of New Plymouth and Napier the South-East Trades blow in summer; but they do not bring the summer drought typical of similar latitudes in other parts of the world. Rainfall is reliable, and generally heavy, only 13 per cent. of all New Zealand having less than 30 inches annually. In the South Island the Southern Alps act as a wind-barrier that makes the west coast very wet and the east coast relatively dry. The air currents shoot down the leeward slopes of the Alps towards the Canterbury Plains as gusty, hot, dry winds, known as "Föhn" winds from the occurrence of the same type in the European Alps.

Since temperatures are everywhere warm enough to promote growth, and nowhere excessively hot, there is little difference between north and south in vegetation and cultivated plants, and even in midwinter pasture makes some growth. The South Island west of the mountain backbone is forested. The natural vegetation east of the backbone is tussock grass, which has been replaced by rye and other sown grasses and by clovers on the lowlands. Instead of

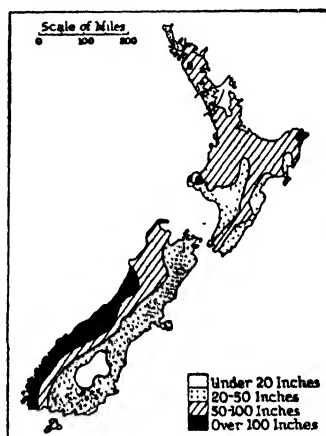


FIG. 46.—New Zealand :
Annual Rainfall.

these open grasslands the original vegetation of the North Island was bracken or dense shrub, which has also been replaced by sown grasses.

SETTLEMENT OF NEW ZEALAND

By the close of the eighteenth century New Zealand had become the centre of the South Pacific sealing and whaling industry. It was visited also for its flax and Kauri pines, suitable for ships' masts and yards. The Maoris, the native inhabitants of the islands, are a Polynesian people. The islands were handed over to Great Britain in 1840 by the Maori chiefs. Auckland became the first capital, settlements being also made at Port Nicholson (Wellington), Nelson, New Plymouth, Otago, and Christchurch. In 1907 New Zealand was proclaimed a Dominion of the British Empire.

THE PASTORAL INDUSTRIES

The increase of population in Australia as the result of the discovery of gold provided an overseas market for New Zealand's agricultural products, and the discovery of gold in New Zealand in 1861 gave a home market as well. Sheep-farming provided a product for export—wool—which could stand transport for 12,000 miles to New Zealand's best market in Great Britain. Only in 1882, however, were the foundations of commercial prosperity really laid with the commencement of the freezing of beef and mutton for export. Oats, the most important grain crop in the Dominion, are grown for stock-feeding purposes, and the farm itself is thus able to provide food throughout the year for its stock.

New Zealand has an even greater number of **sheep** in proportion to population than Australia (20 sheep per inhabitant). They are rather more numerous in the North than in the South Island, the greatest density per acre occurring in both islands where the rainfall is less than 50 inches (Fig. 46). Hardy merino sheep graze the wide runs (ranches) of the hill country that are still under tussock

grass, but in New Zealand as a whole the Romney Marsh, which is better adapted to wet pasturage, is the dominant breed. In the wetter areas **cattle** are generally pastured instead of sheep.

The employment of cold-storage methods in transport gave an opportunity to develop the **dairy industry**; and New Zealand now ranks next to Denmark as an exporter of dairy produce. As practically its sole market is Great Britain, low production costs are essential to offset the cost of transport; and these are made possible by cheap pasture, a mild winter climate which does not necessitate

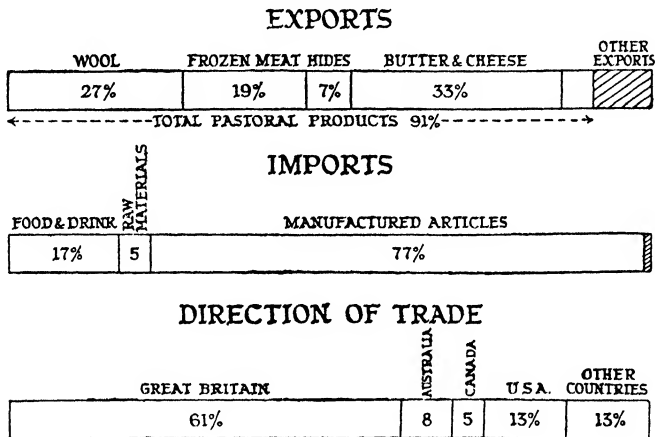


FIG. 47.—Trade of New Zealand.

housing the stock, milking machines driven by hydro-electric power, modern factories for butter and cheese, and co-operative grading of products and methods of marketing. Dairying is concentrated mainly in districts with a rainfall of 30 to 70 inches, on the plains and downs or along the fertile valleys, chiefly in the North Island, and especially on the west coast near Auckland and round Mount Egmont.

Electric Power. New Zealand has small reserves of coal and petroleum to furnish power for industry; but in the amount and reliability of its rainfall, and the presence of numerous lakes to regulate the flow of its rivers, the country has exceptional endowments for the development

of hydro-electric power. It is planned to supply both islands with electricity by a system of generating and transforming stations and transmission lines ; for, although the major part of the demand is for municipal services and small industrial enterprises in the cities, rural requirements probably form a greater proportion of the total demand in New Zealand than in any other country.

CITIES

New Zealand has a population of 1,516,000, 64 per cent. being in the North Island, and more than half the whole in towns of over 2500 inhabitants. Such towns are largely grouped round four widely separated centres—**Auckland** (217,000) in the north, on the narrow isthmus between the two bays of Hauraki Gulf and Manukan Harbour ; **Wellington** (143,000), on the northern shore of Cook Strait, capital of New Zealand since 1865 ; **Christchurch** (127,000), on the Canterbury Plains, with its port of Lyttelton in the shelter of Banks Peninsula ; and **Dunedin** (85,000), with the similar shelter of Otago Peninsula. Railway communication naturally has developed mainly on the plains round the coast, but the Southern Alps are crossed at Arthur's Pass by a line from Christchurch to Greymouth and the main coal-fields near the west coast. Wellington, Auckland, and Nelson are the chief ports.

EXERCISES III

A

1. On a blank map enter these names : Southern Alps, Cook Strait, Foveaux Strait, Mount Ruapehu, Kaikoura Range, Mount Cook, Hauraki Gulf, River Waikato, Lake Taupo, Arthur's Pass ; the six chief towns of New Zealand.
2. What are the chief exports of New Zealand to Britain ? Say from what area each comes.
3. Explain : Maori, Roaring Forties, Kauri Gum, Föhn, pumice, fiord.
4. What difficulties have to be overcome in the export of mutton and dairy produce ? What methods are used to overcome these difficulties ?

5. Where are the Canterbury Plains ? Describe their climate. How do the rivers flow ? Say why.

B

1. Why is the south-west coast of New Zealand so rugged ? Will this district of New Zealand be of any commercial value ? Say in what way.
2. Australia's chief drawback was lack of water : New Zealand has adequate rainfall. What reasons can you give to explain this difference ?
3. Why has New Zealand specialised more than Australia in the production of mutton, butter, and cheese ?
4. Name three sea routes from Great Britain to New Zealand. Find in each case the distance, and the approximate time taken.

THE PACIFIC ISLANDS

“ HIGH ” AND “ LOW ” PACIFIC ISLANDS

The Pacific Ocean covers more than one-third of the globe. Two belts of islands, lying north and south of the Equator between the Tropics, stretch across the ocean two-thirds of the way from Asia to North America, and two-thirds of the way from Australia to South America. These islands are nearly all masses of volcanic rock, that rise on elevated platforms from the bed of the ocean.

They are distributed in lines, in groups, or singly. Some, like the Hawaiian Islands, are peaks sometimes thousands of feet in altitude (Mauna Kea, Hawaiian Islands, 13,825 feet), with their sea-edges fringed by coral reef. These are the “ high islands.” In other cases the rock-core has sunk, perhaps until its top is below sea-level, while the coral at the outer edge of the reef has grown upward until it has formed a ring-like “ atoll,” enclosing a “ lagoon.” These are the “ low islands.” The coral-insects cannot live out of salt water ; but the waves break up the coral into sand, to which winds, currents, and birds bring the seeds of plants, especially of coconut palms, which form a circle of green round the lagoon.

POLITICAL DIVISIONS

The Pacific islanders belong to two different races, with 180° E. and W. longitude as a rough division between them. In the Western Pacific the Melanesians, dark and frizzy-haired, belong to the black, or Negro race. In the Eastern Pacific the Polynesians, taller, light brown in colour, and wavy-haired, like the Maoris of New Zealand, belong to the yellow, or Mongol race. Both peoples are decreasing in numbers, because they are unable to resist European diseases, and because the changes in their way of living that have been brought about by European influence are less healthy for them than their old customs were.

Magellan was the first European to sail the Pacific ; but it was not until 1842-3, when France took possession of the Society Islands (including Tahiti), the Toamotu group, and the Marquesas, that any of the islands came under European control. Fiji was given by its chiefs to Great Britain in 1875 as the first British island colony in the Pacific. Most of the islands of the southern belt west of 165° W. longitude now belong to the British Empire, while those east of 165° have become French. New Caledonia, the largest Pacific island, is also French ; and administration of the New Hebrides is shared between France and Britain. In the northern belt Japan holds the western island groups (formerly German) under mandate from the League of Nations, with the exception of Guam, the largest of the Marianne Islands, which belongs to the United States, and forms a link in the ocean communications between that country and the Philippines. The eastern islands of the northern belt—the Hawaiian, formerly called Sandwich, Islands, where Captain Cook was killed by the natives—are also United States territory.

CLIMATE AND PRODUCTS

The “ low islands ” have so little productive land that practically their only crop is coconuts. The “ high islands,”

in spite of their mountainous nature, have considerable areas of fertile soil. The climate shows little variation between one season and another, owing to the situation of all the islands fairly near the Equator and in wide stretches of ocean. Rain comes throughout the year, and most heavily in those months when the sun's rays are most direct ; but the freshness of the Trade Winds lessens the effect of the heat. In the larger " high islands " there may be a difference of 300 inches between the amount of rain received on the windward and leeward slopes of the mountains.

Bread-fruit, yams, bananas, and other fruits are raised by the natives ; in many of the " high islands " Europeans and Americans have established plantations of sugar, rice, coffee, cotton, and tobacco. The **Hawaiian Islands** are important producers of cane sugar (Fig. 9), most of the labourers on the plantations being Japanese and Filipinos. Coolies brought from India make possible the cultivation of sugar in **Fiji**, most of the export being taken by Canada. Hawaii also produces nearly the whole world output of canned pineapples. Besides their value for the supply of tropical products, many of the islands are used as cable or wireless stations, *e.g.* Fanning Island ; others afford naval stations or trading and victualling ports, such as Honolulu in Hawaii, Apia in Samoa, Suva in Fiji ; while Nauru and Ocean Island have important phosphate deposits.

EXERCISES IV

A

1. Explain the difference between " high " and " low " islands.
2. In what parts of the Pacific Ocean are the island colonies of Great Britain, United States, France, Japan? Name the principal ones.
3. (a) What natural products come from the Pacific Islands?
(b) What other products are exported ?
4. Explain : Lagoon, Filipinos, International Date Line, Mongol.
5. To what use have these islands been put, other than the growing of crops, etc. ?
6. What uses have been made of the coconut ? What is copra?

B

1. Why has it been necessary to allow Asiatic labourers to settle in certain of the Pacific Islands ?
2. On a map of the world draw the great British trade routes (*a*) *via* Suez Canal to Hong Kong ; (*b*) *via* Suez Canal to Australia and New Zealand ; (*c*) *via* Cape Town to Australia ; (*d*) to Canada ; (*e*) to New Zealand *via* West Indies. Name on the map the British territories these routes touch, and explain why the Pacific Ocean as a whole forms a gap in the sea communications of the British Empire.

CHAPTER VIII

ASIA

ASIA is the largest continent. It is a huge land mass nearly as big as Africa, Europe, and Australia combined, which extends from within the Arctic Circle to the Equator. Large peninsulas stretch westwards and southwards from it.

HIGHLANDS. The greater part of Asia consists of highland areas. These are (1) plateaus, (2) folded mountains, and (3) festoons of islands (Fig. 48).

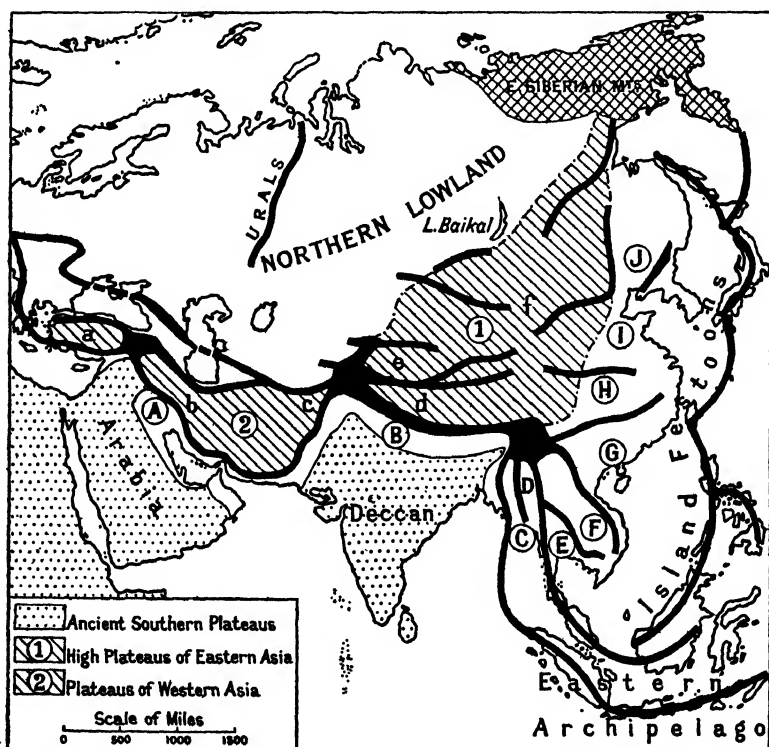


FIG. 48.—The Relief of Asia.

(1) In the south are **two ancient plateaus—Arabia and the Indian Deccan.**

(2) **The Alpine-Himalayan system of folded mountains** is continued from Europe across Asia from west to east. Its ranges are gathered in three great mountain knots, the Armenian, the Pamir, and that of Upper Burma.

(a) From the **Armenian Knot** the **Pontic** and **Taurus** mountains branch westwards to enclose the **Plateau of Anatolia**, and the **Elburz** and **Zagros** mountains branch eastwards to enclose the **Plateau of Iran**. North of the knot the **Caucasus** mountains cross the isthmus between the Black and Caspian Seas.

(b) From the **Pamir Knot** the **Hindu Kush** and **Sulaiman** mountains branch westwards to enclose **Afghanistan**, and the Himalayas, the Kunlun-Tsin-ling Shan, and the Tien Shan branch eastwards. The **Himalayas** and the **Kunlun** enclose the **Plateau of Tibet**. The Kunlun are continued as the **Altyn Tagh—Nan-Shan**, which with the **Tien Shan** enclose the **Tarim Basin**, and are also continued as the **Khingán** mountains, which with the **Altai** enclose the **Gobi Plateau**.

(c) From the **Upper Burma Knot** branch south and eastwards the following mountains :

The ranges that continue the Alpine-Himalayan system through the **Patkai Hills—Arakan Yoma—Andaman Islands—Nicobar Islands—Sumatra—Java**;

The ranges of the **Indo-Malayan** mountains in Burma, Siam, French Indo-China, the Malay peninsula, and Borneo ;

The **South China Plateau**.

The Plateaus of Anatolia, Iran, and Afghanistan are the **Plateaus of Western Asia**. The Plateaus of Tibet and Gobi, the Tarim Basin, and other ranges and plateaus which extend north to the little-known **East Siberian** mountains, are the **High Plateaus of Eastern Asia**. These

two regions, which stand in general more than 3000 feet above the sea and in parts reach much greater altitudes, occupy nearly two-fifths of the continent. They contain vast areas that have little water, and as a whole they are unfit for agricultural settlement. They shut off northern Asia from the eastern and southern lands of the continent.

(3) The **folded mountains of the Western Pacific**, which are partly submerged by the sea, appear as **festoons of islands** from Kamchatka peninsula to the Eastern Archipelago.

LOWLANDS

The lowland areas consist of (1) two river plains between the southern plateaus and the Alpine-Himalayan ranges. These are **Mesopotamia**, really the delta of the **Tigris** and **Euphrates**, and the **Indo-Gangetic Plain**, drained by the Indus and the Ganges and their tributaries.

(2) The river plains of the **Irrawaddy**, the **Salween**, the **Menam**, the **Mekong**, and the **Songkai** (or Red River), which lie between those ranges of the Himalayan and Indo-Malayan mountains, that meet the coast-line.

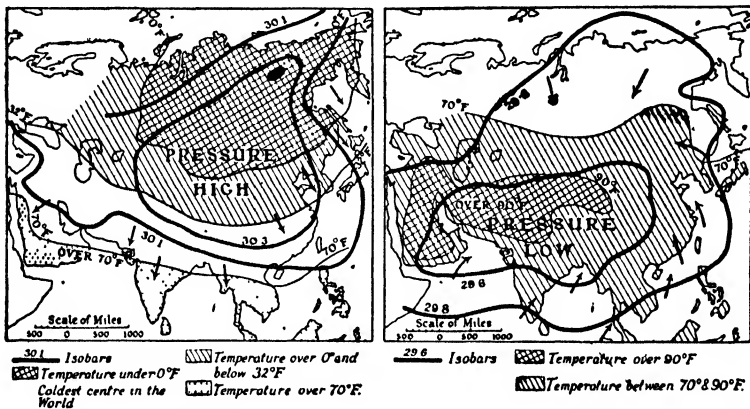
(3) The river plains of China, which have a general west to east direction, and have been formed by the **Si Kiang**, the **Yangtze Kiang**, the **Hwang Ho**, and the **Liao Ho** and the **Sungari**.

(4) A **Northern Lowland** lying west of the East Siberian mountains and north of the Plateaus of Eastern and Western Asia. It continues south of the **Ural** mountains into Europe as the European Plain. Its greatest rivers, the **Ob'**, **Irtish**, **Yenisei**, and **Lena**, have short courses on the Plateaus of Eastern Asia, and long courses across the Lowland to the Arctic Ocean. In the south-west Turkistan is an area of internal drainage, where the **Oxus** and **Sir Darya** flow to the Aral Sea, and the Ural flows to the Caspian Sea.

The Ural River and the Ural and Caucasus mountains form the boundary between Asia and Europe.

CLIMATE

The vast area of the continent gives most of it a **monsoon climate**, almost independent of the wind belts that govern climate in other parts of the globe. In **winter** air pressure becomes very high over the continent north of the Himalayas, and cold, dry winds blow outwards towards the coast (Fig. 49). The lands south of the Alpine-Himalayan barrier are, however, protected against this cold air from Central Asia ; and India, Indo-China, and South China are



January. July.
FIG. 49.—Asia : Temperature and Pressure.
(Arrows show direction of prevailing winds.)

called the **Tropical Monsoon** Lands. The lands north of the mountain barrier have a **Temperate Monsoon** climate, with extremely cold winters. The lowest temperature in the world (-60° F. or 92° of frost) occurs in the north-east of the continent at Verkhoyansk.

The consequence of these out-blowing winds is that most of Asia receives no rain in winter. Exceptions to this rule are (1) countries in continuation of the Mediterranean basin, which receive cyclonic rain from the Westerlies. This rainfall lessens in proportion to distance from the coasts of the Mediterranean and Black Seas ; (2) lands lying in the

Equatorial belt from 5° N. to 5° S. of the Equator; and (3) mountainous lands, such as Japan, Taiwan, the Philippines, the Malay peninsula, and Ceylon, that are reached by winds blowing over areas of sea.

Summer climatic conditions are the opposite of winter conditions. The great land mass heats up, and an area of low atmospheric pressure is formed. Into this winds blow from the sea, bringing rain. This monsoon rain falls very heavily in all the southern and eastern lands of Asia from India to Kamchatka, the wet season being longer in the south than in the north. In one month (July) Bombay receives $24\frac{1}{2}$ inches of rain, Hong Kong receives 16, Peiping $9\frac{1}{2}$, and Moukden $6\frac{3}{4}$. Only the countries that lie immediately eastward of the Mediterranean Sea receive no summer rain, because the belt of Westerly Winds has moved north at this season. As, however, the monsoon rains fall most heavily where the in-blowing winds first meet mountain obstacles, little moisture reaches the plateaus of central Asia north of the Alpine-Himalayan mountains (Fig. 50). The uplands of the Yemen in southwestern Arabia receive rain from the Zanzibar Monsoon (p. 142); and the lands of the Equatorial belt continue at this season to have rain.

NATURAL VEGETATION

The Rainfall Map (Fig. 50) as usual explains the distribution of natural vegetation. **Tropical Forest** covers the Malay peninsula and the islands of the Eastern Archipelago. Deciduous **Monsoon Forest**, in which teak is the most valuable timber, grows in India, in Indo-China, and in southern China south of the Tropic of Cancer wherever the rainfall is greater than 40 inches in the year. A wide belt of **Temperate Forest** crosses Siberia approximately between the parallel of 50° N. latitude and the Arctic Circle. It is linked to the Monsoon Forests by the forests of Japan and China, half-temperate, half-tropical. These contain different varieties of the tree-like grasses—bamboos, that are put to many uses in eastern Asia, from house-building

to human food. The drought-resisting vegetation of **Winter Rain** areas occupies the Mediterranean coast-lands of Anatolia and Syria.

Savanna is found on the Indian Deccan plateau and in northern India where the rainfall is between 20 and 40 inches annually. **Temperate Grassland** occurs in central

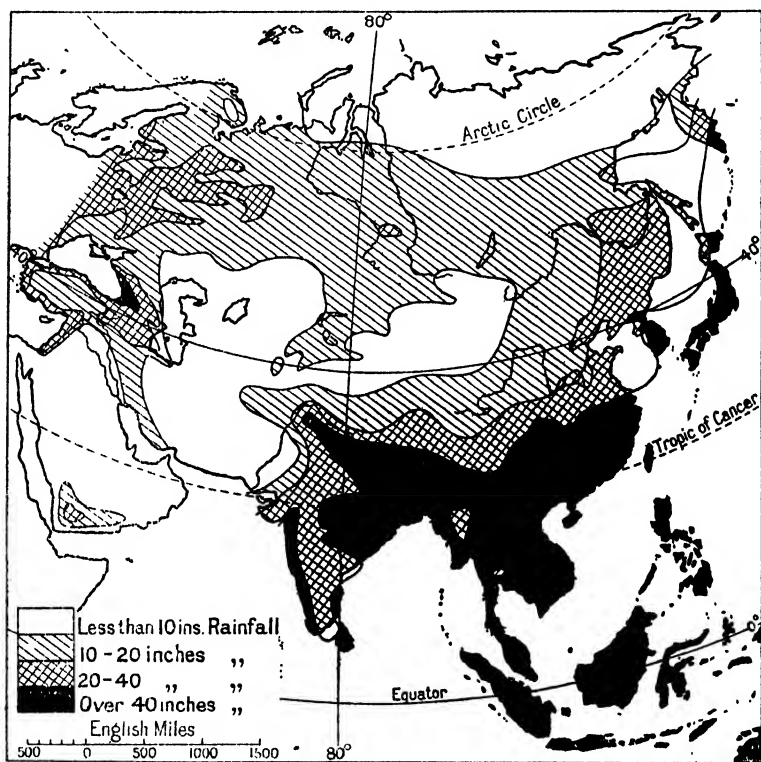


FIG. 50.—Asia : Annual Rainfall.

and northern China, in Manchuria, and along the southern edge of the Siberian forests. Fully two-thirds of the continent, however, receives less than 20 inches rainfall in the year, and millions of square miles of its area are either actual **Desert**, or else are so poorly watered as to be semi-desert—useless to man except to support scanty numbers of sheep, goats, horses or cattle, yaks or camels, that must be constantly on the move in search of fresh pasture. Scattered

like islands through this vast territory are oases where irrigation makes possible the raising of crops.

The chief deserts lie in two belts :

- (i) The **Hot Trade Wind Deserts** of Arabia, Persia, Thar, and Russian Turkistan ;
- (ii) The **Cold Monsoon Deserts** of Takla Makan, Dzungaria, and Gobi.

A great belt of **Tundra** extends along the whole coast of the Arctic Ocean, where lichens and mosses give grazing for the reindeer of wandering, primitive tribes. Tundra, glaciers, and snow-fields cover the higher areas of the lofty mountain ranges that border the High Plateaus of Eastern Asia.

THE PEOPLES OF ASIA

Of the three main divisions of mankind (woolly-haired, straight-haired, and curly or wavy-haired) the **woolly-haired**, or negro race, is represented in Asia by very primitive tribes, such as the Andamanese and the Semang of Sumatra. **Straight-haired** peoples, of the yellow or Mongoloid race, with prominent cheek-bones and generally flattened face, live in north and eastern Asia, and include tribes of west and northern Siberia (Samoyeds, Ostiaks, etc.), Manchus, Chinese, Japanese, and Malays, and in Central Asia Turks and Mongols. Most of the peoples of India, the Arabs, and the Jews, belong to the **wavy-haired** division of mankind (white and brown races). Nearly everywhere, however, much mixture of races has taken place.

Half the population of the world lives in the southern and eastern countries of Asia and in the Island Festoons and the Eastern Archipelago (Fig. 10). In Chapter II. (p. 57) we explained this density of population by the fact that most of these people live mainly on rice. There is a moderate density of population in the Winter Rain lands at the east end of the Mediterranean Sea, which form part of an area in Europe that contains one-quarter of the world's population.

Between these two populated areas lie the great areas of nomadic herding. Their peoples are brave, active, and accustomed to hunger and fatigue, for without these qualities they could not succeed in their way of life. Further, at an early period in history they tamed animals for transport, which gave them the power to move swiftly. The camel was used in the southern pastures of Iran and Arabia ; the horse was used first in the northern pastures

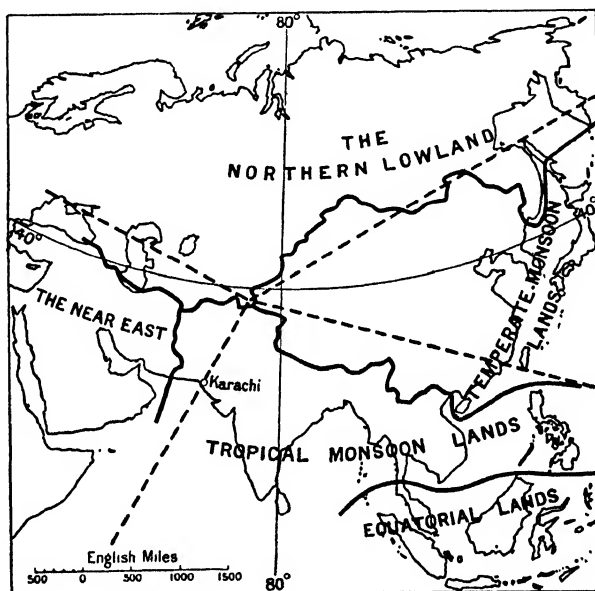


FIG. 51.—Regions of Asia.

of central Asia, and was introduced later into the southern pastures.

These nomad herdsmen have been throughout history a constant danger to the settled peoples on their borders. China, India, and the countries round the Mediterranean Sea on several occasions came under the rule of new masters from the nomadic herding lands. In ordinary times the nomads traded with the cultivators ; and some of the markets where goods were exchanged became religious centres, such as Mecca, Jerusalem, and Lhasa.

NATURAL REGIONS OF ASIA

The broken lines in Fig. 51 drawn from the Pamir Knot roughly divide the continent into climatic regions, which are slightly modified by the continuous lines. These regions are :

- (1) The **Near East**, a Western Wind, Winter-Rain region, changing inland to Hot Desert.
- (2) The **Tropical Monsoon Lands**, including India and Indo-China.
- (3) The **Equatorial Lands** of the Eastern Archipelago.
- (4) The **Temperate Monsoon Lands**, changing inland to Cold Desert.
- (5) The **Northern Lowland**.

EXERCISES I

A

1. On a blank map of Asia print in these names : Siberia, Arabia, Turkistan, Burma, Ceylon, Mongolia, Anatolia, China, East Indies, Persia, 'Iraq.
2. On a blank map trace the courses of these rivers : Euphrates, Tigris, Indus, Ganges, Brahmaputra, Yangtze, Hwang Ho, Lena, Yenisei.
3. Give the geographical names corresponding to the letters (small and capital) which are printed in Fig. 48. Name also the chief mountain ranges and knots.
4. Show also on your map the position of : Thar Desert, Desert of Gobi, Lake Baikal, Lake Balkhash, Sea of Aral, Indian Ocean, Sea of Japan, Bay of Bengal, Strait of Malacca.
5. Name an area of Asia which in winter (a) has heavy rainfall, (b) has moderate rainfall, (c) is very cold (d) is very warm.
6. Name areas of Asia where the rainfall is (a) orographical, (b) cyclonic, (c) convectional.
7. In what parts of Asia are these animals used for transport : Camel, yak, elephant, reindeer, horse, mule ?
8. Name an area where the vegetation will be (a) sparse, (b) luxuriant. Name three areas where irrigation is practised.
9. (a) What is the chief difference between Tropical and Monsoon Forest ? (b) Where does each variety occur in Asia ?
10. (a) Which climatic regions contain (i) dense, (ii) moderately dense population ? (b) Account for this distribution of population.

B

1. (a) Which are the two ancient plateaus of Asia ? (b) Why are they unfit for agricultural settlement ? (c) In what way do they affect communications in Asia ?
2. Is it right to call Asia the " cool, dry continent " ? What areas conform to this description ? What areas are exceptions ?
3. Why do the southern and eastern countries of Asia contain the greatest population ?
4. Why is there so little intercourse between the various countries of Asia ?

THE NEAR EAST: DIVISIONS AND CLIMATE

To Europeans south-west Asia is " the Near East." This region is divided from the Monsoon Lands by great

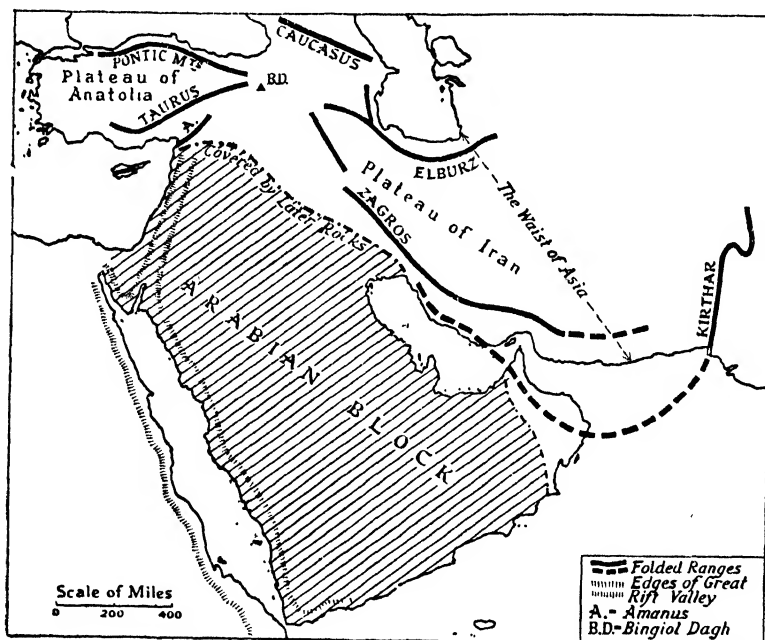


FIG. 52.—Structure of Near East.

salt deserts across the " Waist of Asia," 700 miles wide, between the Indian Ocean and the Caspian Sea (Fig. 52). It is divided from the Northern Lowland by the Elburz mountains. The Near East consists of :

- (i) The mountain chains which radiate from the peaks of the Bingiol Dag, in the centre of the Armenian Knot, and the Plateaus of **Anatolia** and **Iran** which these ranges enclose ;
- (ii) The plateau block of **Arabia** ; and
- (iii) The river plain of **Mesopotamia** ("the land between the rivers").

Climate is of the "Mediterranean" type, with the exception of Yemen in south-west Arabia, which has summer rain (p. 199). The winter rainfall, however, is

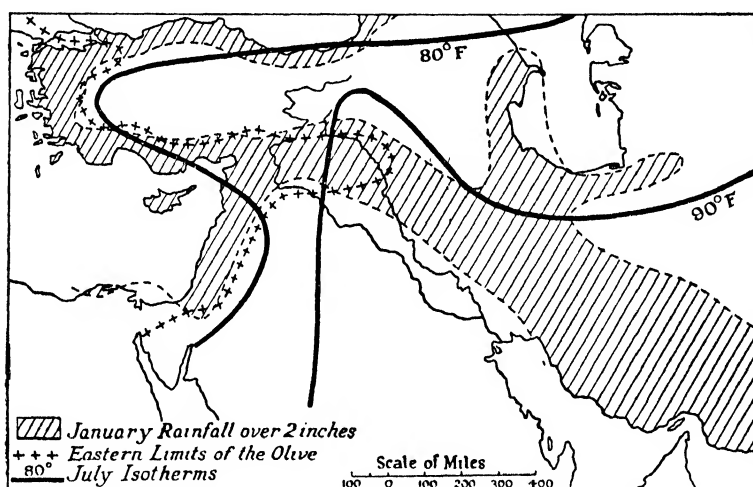


FIG. 53.—Cultivation Conditions in Near East.

largely caught by the mountains on the margins of the Anatolian Plateau and by the highlands of the Rift Valley, so that only between these two elevated areas do the winds carry moisture far inland (Fig. 53). While, therefore, the natural vegetation of the coastal plains and the seaward slopes of the mountains is "Mediterranean" evergreen woodland, the areas that are rain shadows are poor grassland or desert. Fig. 53 shows the eastern limit beyond which the characteristically "Mediterranean" olive tree does not grow.

Until the Great War all the lands of the Near East (with the exception of Persia and parts of Arabia) were

part of the Turkish Empire. To-day **'Iraq** and **Saudi Arabia** are independent Arab kingdoms ; **Syria** and **Transjordan**, both with Arab populations, are administered respectively by France and Great Britain under Mandates from the League of Nations ; **Lebanon**, **Latakia**, and **Jebel Druze** are smaller territories under similar administration by France ; while in **Palestine**, where the majority of the population consists of Mohammedan Arabs, Great Britain has undertaken the difficult task of making " a national home for the Jewish people."

In Arabia Britain has for nearly one hundred years controlled a wide desert territory round the fuelling-port of **Aden** at the southern entrance to the Red Sea.

(a) **The Anatolian Plateau (Turkey).** The Pontic mountains are a series of short, forest-clad ranges that descend sharply to a narrow **coastal plain along the Black Sea**. Wheat, maize, and " Mediterranean " fruits are cultivated, but in the wider eastern portion of the plain near Samsun, where the Caucasus gives shelter against cold north winds in winter, tobacco is the most important crop. The chief harbours are Zunguldak, a small open bay that serves the Eregli coal-field, and Samsun, the main tobacco port.

The Taurus mountains also fall sheer to the Mediterranean Sea. Between them and the Amanus mountains the coastal **plain of Cilicia**, facing the Gulf of Alexandria, is flooded yearly, like Egypt, by the mountain streams. This enrichment of its soil and its hot summer (Fig. 53) make cotton and sugar cane, as in Egypt, its most important crops.

Between these rims the **Plateau** is rolling grassland, hollowed in its centre, where lie a salt desert and a great salt lake. This grassland is grazed by herds of sheep that furnish wool, mutton, and " yogurt " (sour sheep's milk)—the main food of the Anatolian peasant, and by the Angora goats, from which is obtained mohair. The Plateau tilts westwards, till the mountain chains that cross its surface run out as long peninsulas and rocky islands into the **Ægean**

Sea. The **valleys of Western Anatolia** are the most important agricultural area of the Near East. Cereals, tobacco, opium, and fruits are extensively grown, the figs and dried grapes (sultanas) of the Izmir (Smyrna) district being specially noted. The neighbourhood of **Izmir** (153,000 pop.) also produces cotton.

Since western customs have been introduced, **Ankara** in the heart of the Plateau of Anatolia has been made the capital of Turkey instead of Constantinople (Istanbul), and 1,000,000 Greeks, amongst them many enterprising farmers and traders, have been driven from the country.

(b) **The Plateau of Iran (Persia)**. So lofty are the mountain walls that enclose this **Plateau** that its winters are dry and cold and its summers dry and very hot (Fig. 53). Sheep are pastured on the highland grasslands in summer, and brought down to sheltered plains in winter. From their wool the famous rugs and carpets of Persia are woven. Along the **coastal plain** between the Elburz mountains and the Caspian Sea, the climate is so warm and moist that rice, sugar cane, tobacco, and the mulberry are grown. Rice forms a part of every Persian meal. Elsewhere cultivation depends on the irrigation of **garden oases**, such as **Tehran** (350,000 pop.), Kashan, Yezd, Kerman, Bushire, and Bandar 'Abbas, with water from the streams of the Elburz and Zagros mountains. The chief wealth of this area comes from the oil-fields that lie along the edges of the folded mountains, the most important being the Maidan-i-Naftun. **Petroleum** represents 70 per cent. of Persia's export trade.

(c) **Mesopotamia ('Iraq)**. High up on the flank of the Bingiol Dagħ rises a great river—the Euphrates; farther south in the Taurus another—the Tigris—has its source. Both issue from the mountains about 37° N. latitude, flow across the surface of the Arabian Plateau as far as Baghdad, and below that city have built up a gently sloping alluvial plain. As practically no rain falls, cultivation in this delta depends upon irrigation by the flood waters of the river; and in Mesopotamia, as in Egypt (p. 168), these waters were

used for this purpose in very early times. The kingdom of Babylonia was established in the delta, that of Assyria farther north in the middle course of the Tigris.

Unlike the Nile, the Euphrates and Tigris flood in spring, so that much water has to be stored for use in the dry growing season. They bring down gravel, which is apt to choke the irrigation ditches, whereas on the Nile such material is deposited above the Cataracts. Even under these disadvantages, the delta has been made of great agricultural value, raising winter crops of wheat and barley and summer crops of rice and cotton. The chief product, however, is **dates**. 'Iraq contains about one-third of all the date-palms in the world. Their fruit is partly exported, partly eaten by the Arabs, who weave the leaves into matting to make houses and use the trunks for building. Its winter rains enable the plain of northern 'Iraq to grow wheat. The country shares with Persia in the oil-fields of this region, which provide cheap power to pump water from the irrigation canals.

Baghdad is by origin a trading city on the margin of the nomadic herding lands. For five centuries it was the capital of the Mohammedan world, and a centre where caravans from Syria and Arabia met those from Persia. Its port is **Basra**, 60 miles from the Persian Gulf up the united stream of the Euphrates and the Tigris.

(d) **The Countries of the Rift Valley (Syria, Palestine, Transjordan)**. About 90 miles from the Mediterranean coast the Rift Valley cuts the surface of the Arabian Plateau, forming in succession (1) the **valley of the Orontes**; (2) the **Syrian Hollow** between the mountains of Lebanon and Anti-Lebanon; (3) the **Jordan valley**, which sinks deep between the highlands of Palestine and of Moab, and lies 1300 feet below sea-level at the salt lake of the Dead Sea. There is a narrow **coastal plain** along the Mediterranean, on the seaward margin of which an east-flowing current has built sand-dunes with silt from the Nile as far north as the Bay of Acre. Thus Palestine has no good natural harbours, though an artificial harbour has

been built on the Bay of Acre at **Haifa**. Farther north the spurs of Lebanon come down to the sea, and form promontories and islands, providing shelter for the ancient Phœnician harbours of Tyre and Sidon and the modern seaport of **Beirut** (134,000 pop.), the capital of Lebanon.

As rainfall decreases eastwards beyond the Rift Valley and southwards towards the Sinai Peninsula (Haifa 27 inches, Gaza 17 inches), the most productive areas are the coastlands and the Lebanon, where wheat, barley, oranges, lemons, figs, melons, grapes, mulberries, and tobacco are cultivated, Jaffa oranges being specially celebrated. East of the Rift Valley the Orontes supplies irrigation water for the plain of Hama and the Barada for the oasis of Damascus.

Damascus (193,000 pop.), the capital of Syria, was anciently the meeting-place of caravan routes across the desert from Mesopotamia and from Egypt along the coastal plain ; to-day it has railway connection through the Barada Gorge with Beirut. The great trade-centre of northern Syria is **Aleppo** (177,000), the junction of the Hejaz and Baghdad railways. The former runs through the Syrian Hollow to Medina in Arabia ; the latter runs from Istanbul and Izmir towards Baghdad through the Cilician and Amanus Gates in the Taurus and Amanus mountains. **Jerusalem** (90,000), situated in a strong position on the Palestine highland, is a Holy City to Christians, Jews, and Mohammedans alike.

A continuation of the Amanus range rises out of the Mediterranean 60 miles from the coast of Syria, and forms the mountains of **Cyprus**, which is a British possession, and grows wheat, barley, and the typical "Mediterranean" fruits. The chief town is Nicosia.

(e) **Arabia**. This land belongs geographically to North Africa. Much of its area is occupied by sandy deserts—the Nefud in the north, and the Ruba el-Khali in the south. In central Arabia are three groups of oases, the largest being Nejd, whose ruler controls the whole of **Saudi Arabia** south of 'Iraq and Transjordan, and north of the Ruba el-Khali and Yemen, including the two

Holy Cities, **Mecca** and **Medina**, which are visited yearly by some 170,000 pilgrims from all the Mohammedan lands.

The richest and most populous areas of Arabia are the south-west and the south-east—Yemen and Oman. **Oman** and Hasa (on the Persian Gulf) contain three-fourths of Arabia's date palms; **Yemen**, with its summer rainfall, cultivates wheat, barley, millet, a variety of fruits which includes apples and plums, and the celebrated "Mocha" coffee. Apart from these coastlands and the oases, Arabia is mainly a land of nomad herdsmen.

STATISTICS OF NEAR EASTERN COUNTRIES

Country.	Area.	Population.	Capital.
Turkey (Asiatic) . . .	285,000	12,615,000	Ankara.
Persia	628,000	10,000,000	Tehran.
'Iraq	177,000	2,849,000	Baghdad.
French territories . . .	60,000	2,831,000	..
Palestine	10,000	1,035,000	Jerusalem.
Transjordan . . . . .	..	260,000	Amman.
Saudi Arabia . . . . .	..	4,000,000	Riyadh.

EXERCISES II

A

- On a blank map of Western Asia insert these names :
 - Anatolia, Palestine, Syria, 'Iraq, Persia, Saudi Arabia, Yemen, Persian Gulf, Pontic and Taurus Mountains.
 - Damascus, Izmir, Ankara, Beirut, Aleppo, Mecca, Jerusalem, Jaffa, Haifa, Baghdad, Basra, Tehran.
- What physical barriers divide the Near East from the rest of Asia ?
- What areas produce the following : petroleum, tobacco, rice, olives, coffee, mohair, dates, oranges, carpets ?
- Explain : "yogurt," mohair, mocha, sand-dune.
- Name three areas in which cotton is grown. How has it become possible to grow this crop ?

B

- Why does Haifa receive 27 inches of annual rainfall and Baghdad only 9 inches ?

2. (a) Which of the territories named on p. 210 are mandates ?
 (b) What prevents Arabia from becoming one united kingdom ?
 (c) Why has Palestine no good natural harbours ?
3. Account for the following mean temperatures :

	January.	July.
Tehran . . .	34° F.	85° F.
Aden . . .	76° F.	88° F.
Haifa . . .	54° F.	80° F.
4. Account for the position of : Baghdad, Izmir, Damascus, Aden, Mecca.
5. Trace on the map the course of the Baghdad Railway from the Bosphorus by Konya to Aleppo, stating the means by which it crosses the mountain obstacles on its route.
6. In what ways has this part of Asia shown the influence of Western Europe ?

TROPICAL MONSOON LANDS : DIVISIONS AND CLIMATE

From the Plateau of Tibet two great peninsulas project southwards—**India** and **Indo-China**. These, with the **Philippine Islands**, are the Tropical Monsoon Lands.

The monsoon climate has three seasons, which may best be understood by a description of the climate of India.

(1) The **Cold Weather Season** lasts from October to the end of February. This is the most pleasant time of year on the plains. Average January temperature increases southward from below 50° F. at Peshawar to 79° at Colombo. The weather is dry, for the winds blow from land seaward ; but November and December are the wettest months on the coast of Madras (Coromandel Coast), because it is reached by winds which have crossed the Bay of Bengal. Cyclones from the Mediterranean bring rain also to north-west India.

(2) The **Hot Weather Season** is from March to the end of May. These are the hottest months over most of India. Again the weather is mostly dry ; but the heat lowers the pressure of the atmosphere, so that winds are drawn on-shore from the ocean, which give rain in southern India, Ceylon, and Lower Burma.

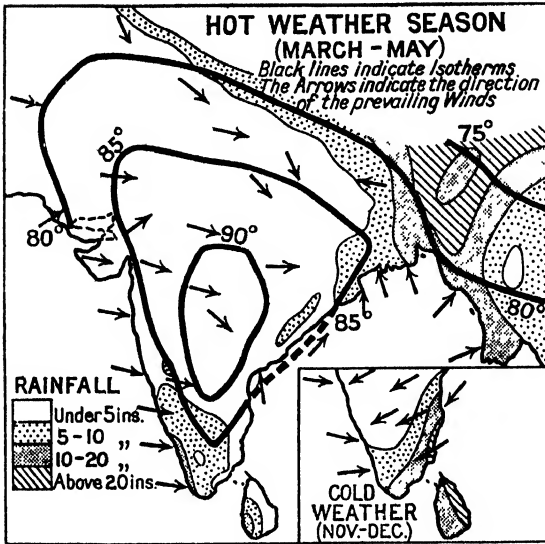


FIG. 54.—Climate of India : Hot and Cold Weather Seasons.

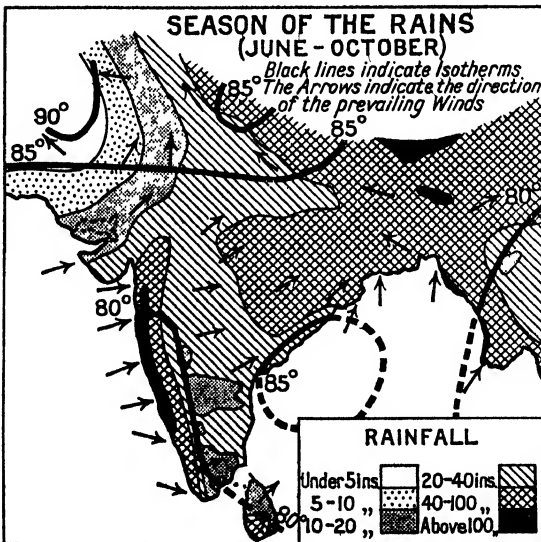


FIG. 55.—Climate of India : Season of the Rains.

(3) The **Rains** (June to October). About mid-June the monsoon "bursts." The winds greatly increase in strength, so that on many parts of the coast shipping cannot keep the seas. They blow strongly from the south-west on the west coast, and westward up the Ganges valley. Between these two main wind-streams lies an area hardly reached by moisture from either—the Thar desert. At this season all India except the south-east coast receives most of the year's rainfall. With the "breaking" of the monsoon the temperature falls, and, though the atmosphere is unpleasantly moist, vegetation springs to life again.

Unfortunately the "Rains," though regular in arrival, vary greatly in amount and duration, so that they sometimes finish just when moisture is required for the ripening or sowing of crops. Thus certain districts are very liable to droughts and famines, especially where the average rainfall is less than 40 inches in the year.

(a) **THE INDIAN EMPIRE : PHYSICAL DIVISIONS**

The Indian Empire includes Burma in the Indo-Chinese peninsula and Baluchistan in the Plateaus of Western Asia, but excludes Ceylon. Its area (1,805,000 square miles) is almost that of a continent, being roughly equal to Europe without Russia. It has four main physical divisions :

(1) South of the Tropic of Cancer is the triangular **Deccan** Plateau, with its apex at Cape Comorin, and its base the Vindhya and Satpura Hills, which stretch from the Arabian Sea nearly to the Ganges below Benares. The other sides of the triangle are the **Western** and **Eastern Ghats**. The three great rivers of the Deccan, **Cauvery**, **Kistna**, **Godaveri**, rise in the Western Ghats and break through the Eastern Ghats in their courses to the sea.

(2) The **Indo-Gangetic Plain**, 2000 miles long by 150 to 200 wide, is floored to an immense depth with alluvium, laid down by rivers from the waste materials of the mountains. Three river systems carry to it the

drainage of both the northern and the southern slopes of the Himalayas :

- (i) The **Sutlej-Indus** system rises in a deep trough beyond the Himalayas, and flows, first north-west and then south-westward, to a delta on the Arabian Sea. The tributaries of the Indus (Jhelum, Chenab, Ravi, Bias, and Sutlej) have given to their basin, the Punjab, its name of " the Five Rivers."
- (ii) The **Brahmaputra** also rises in the Himalayan trough, where it is known as the Tsangpo, not far from the source of the Indus, and flows east and then south to the Bay of Bengal, where it unites with the Ganges.
- (iii) The **Ganges** system (of which the main tributary is the Jumna), drains the southern slopes of the Himalayas south-eastward to a delta on the Bay of Bengal. Another tributary, the Gogra, breaks through the Himalayas roughly mid-way between the Indus and Brahmaputra.

On the Plain the water-parting between the Indus and Ganges at its highest point is only 924 feet above the sea, and the average slope of the Plain in either direction is only 1 foot per mile. Both these river systems, fed by the eternal snows of the Himalayas, are thus of value for water transport and irrigation.

(3) In the north are the **Alpine-Himalayan mountains** which shut off India from Central Asia. On the north-east the **Himalayas**—" the abode of snow "—tower skywards for 1500 miles to heights of 17,000 to 19,000 feet, with a width of 150 to 200 miles. At their south-eastern end they rise to the highest group of mountains in the world round **Mount Everest** (29,000 feet) and **Kangchenjunga** (27,800). The northern end of the Himalayas forms the Indian State of Kashmir ; on their slopes are the independent countries of Nepal and Bhutan.

On the north-west are the **Hindu Kush** and the **Sulaiman mountains**, which enclose Afghanistan, an area

of internal drainage except for the Kabul River, which breaks through the mountains to join the Indus. Across passes of the outer chain of the Hindu Hush and the inner chain of the Sulaimans have come the traders and armies of Central Asia, since before the days of Alexander the Great, to the rich plains of India. Of the inner passes the most important are the Khyber, Gomal, and Bolan.

(4) The fourth division belongs geographically to the **Indo-Chinese Peninsula**, and consists of the **Patkai Hills** and **Arakan Yoma**, and the river plain of the **Irrawaddy**.

INDIAN NATURAL VEGETATION

All districts which receive more than 40 inches annual rainfall (Fig. 50) have a natural covering of forest. Ever-green Tropical Forests prevail on the slopes of the Himalayas, the coastlands of Burma, and the Western Ghats, where the fall exceeds 80 inches; elsewhere the forests are of the deciduous Monsoon type. In many parts these forests have been cleared for cultivation. Where the rainfall is between 40 and 20 inches forests appear only in localities specially suited to the growth of trees, the vegetation being mostly bushes and grass. The high temperature, causing much evaporation, produces desert or semi-desert where there is less than 20 inches rainfall in the year.

AGRICULTURE IN INDIA

Three out of every four of the inhabitants of India depend upon agriculture. **Rice** is the most important food crop, occupying about a quarter of the cultivated area. It is the cereal of the wetter parts of India, and is not much grown where there is less than 40 inches annual rainfall (Fig. 50). Except in the Irrawaddy delta in Burma, it is cultivated almost entirely for local consumption, and is the food of perhaps one-third of the population (Fig. 8).

Millet occupies about one-fifth of the cultivated lands. It is the food and fodder crop of the drier regions that have between 40 and 20 inches rainfall. **Pulses**, of which the

most important is gram, are widely sown along with millet. These take longer to ripen, so that, if the millet fails from lack of rain, the farmer still has his pulse crop to rely on. They supply nitrogen to the soil, and protein to human diet.

Wheat is specially important on the irrigated lands of the Punjab, where there is a marked cool season, and also, in the north, winter rain to swell the grain. In normal years there is a surplus available for export (Fig. 7) Maize and barley, pepper, ginger, and others of the spices which made India important to Europeans in the Middle Ages, are also grown.

Cotton is the most important of the "money" crops grown for market, with oil-seeds second. India comes next to the United States and China in cotton production. It is cultivated chiefly in districts with less than 40 inches annual rainfall, the most important being (1) the "black cotton soils" of the Deccan, which because of their fine texture are able to retain moisture, (2) the fertile alluvial plains of the Indus and upper Ganges, and (3) parts of Madras in southern India. The finer qualities of long-stapled cotton require a six-months' growing season. In India, however, the sharp climatic division into three seasons allows a growing period of, at best, three and a half months. Indian cotton is thus short-stapled, except where the growing season can be extended artificially by irrigation.

Oil-seeds are grown in the Deccan, the Ganges valley, and central Burma, both as native food crops, because they contain protein, and for export. They include sesamum, linseed, ground-nuts, coco-nuts, and castor-oil. The Ganges delta raises nearly all the world's **jute**. Nearly half the world's export of **tea** comes from Assam, while a secondary district of production is Travancore in southern India. India grows a large crop of **sugar cane** (Fig. 9), and is second to the United States as a producer of **tobacco**.

There are 123,000,000 cattle (oxen and buffaloes) in British India, but they are used only for ploughing and

draught. To the Hindu (though not to the Mohammedan) the cow is a sacred animal, and may not be used for food. Religious principles unfortunately prevent any improvement of the breed.

In the dry areas agriculture depends on irrigation. Nearly one-fifth of the whole acreage under crops is irrigated. Irrigation takes several forms, of which the chief are perennial canals, supplied from great reservoirs, mainly in the Punjab, United Provinces, Sind, and Madras, and "tanks" (ponds formed by stone and mud dams across small streams) in southern India. The reservoir formed by the Sukkur Dam on the Indus, recently completed, will supply water to an area greater than all the cultivated land in Egypt

MINERALS AND INDUSTRIES IN INDIA

India is not an important producer of minerals. Its principal coal-fields are in the north-east of the Deccan Plateau; and there are large oil-fields in Burma. Manganese ore is mined in the Central Provinces of the Deccan, India supplying the world's largest output after the Soviet Union; lead is mined in northern Burma, and gold in Mysore State. Thus the Deccan and Burma are India's two chief mineral regions.

India is developing modern industries at the expense of the old village industries, which are dying out. Most of the factory workers are employed in the making of **textiles**, especially of cotton and jute. Indian cotton mills supply 90 per cent. of the local demand for yarns, and 60 per cent. of the local consumption of piece-goods, using mainly the short-stapled Indian cotton. Short-stapled cotton goods are exported to Japan, China, and certain European countries, while long-stapled raw cotton is imported from East Africa for manufacture in Bombay mills. The opening up in 1854 of the Raniganj coal-field in Bengal made possible the manufacture of about half the jute crop as "gunny cloth" for baling the country's agricultural products. This industry is carried on in mill towns north

of Calcutta. A small portion of India's requirements in iron and steel is supplied by the Tata works in Bihar. Tea, rice, sugar, and tobacco factories, engineering and railway workshops, shipbuilding yards, oil mills, sawmills, and printing works are other modern enterprises.

COMMUNICATIONS IN INDIA

There are about 40,000 miles of railway. These spread inland from the great ports. They form a close net-work of lines in the Ganges valley, and are more openly distributed in southern India. Military lines have been built on the frontiers of Afghanistan and Persia, but no railways connect with those of neighbouring countries. With the increased use of the rivers for irrigation, these have become shallower and less suitable for transport; the Irrawaddy and the Ganges east of Patna still remain important for this purpose. Good motoring roads are few.

CITIES AND TRADE OF INDIA

There are seventeen cities in the Indian Empire with a population of over 200,000. Five are seaports, five are in the Ganges plain, five in peninsular India south of the Tropic, and two in the Punjab.

Before the days of railways, the Thar desert and the Aravalli Hills together made an obstacle practically impassable for an army. The Jumna was impassable because of its breadth and the marsh and jungle on its banks. Through the gap between the Jumna and the desert, 20 miles wide, all movement north or south had to pass. In this gap stands **Delhi** (477,000 pop.), the capital of India, on the west bank of the Jumna. Its situation has made it a great railway centre. It has modern cotton mills, as also has **Agra** (229,000), famous for the tomb of the Taj Mahal. **Lucknow** (274,000), and **Cawnpore** (243,000) are industrial cities on the Ganges; **Benares** (205,000) is a centre of Hindu religious life and pilgrimage.

The violence of the monsoon winds and the rough surf on the coasts help to concentrate the sea-borne trade of

India and Burma on the five great ports. **Calcutta** (1,485,000), in spite of its position 80 miles up-river on the Hooghly and off the world's main ocean routes, is, after London, the largest city in the British Empire. It exports jute from Bengal, tea from northern India, hides, oil-seeds, grain, metals, and ores. **Bombay** (1,161,000), situated on a fine island-harbour midway on the west coast, is the seaport nearest to Europe. Its hinterland includes the "black cotton soil" district of the Deccan, to which it has access through two passes in the Western Ghats. It ships raw cotton, manganese, and oil-seeds, and imports long-stapled cotton for its mills, where the machinery is driven by hydro-electric power obtained from rivers of the Ghats.

The Deccan Plateau, owing to its structure, lacks natural harbours. The only good harbour on the east coast is that constructed at **Madras** (647,000) to serve a productive hinterland, exporting hides, cotton, and oil-seeds. The seaport that ships the wheat and cotton of north-west India, and the airport of the airway from Europe, is **Karachi** (263,000), west of the Indus delta. **Rangoon** (400,000) is the capital and port of Burma, its chief export being rice. **Mandalay**, on the Irrawaddy 350 miles north of Rangoon, is the only other large town in Burma.

The two cities of the Punjab, **Lahore** (429,000) and **Amritsar** (264,000), were strongholds of the Sikhs against the Mohammedans. Lahore is the capital of the Province and a railway centre; Amritsar has a manufacture of carpets. Of the five peninsular cities, **Hyderabad** (466,000) is the capital of the great native state of Hyderabad; **Ahmedabad** (313,000) is the collecting centre of northern Gujarat, with important cotton mills; **Bangalore** (306,000) is the administrative centre of Mysore State, and manufactures silk; **Poona** (250,000) is a gap-town of the Western Ghats; and **Nagpur** (215,000) is a cotton town midway between Bombay and Calcutta.

Fig. 56 shows that over 70 per cent. of India's exports is food-stuffs and raw materials, and that about the same proportion of the imports is manufactured articles. Great

Britain supplies more than one-third of the imports and takes more than one-fifth of the exports, buying from India

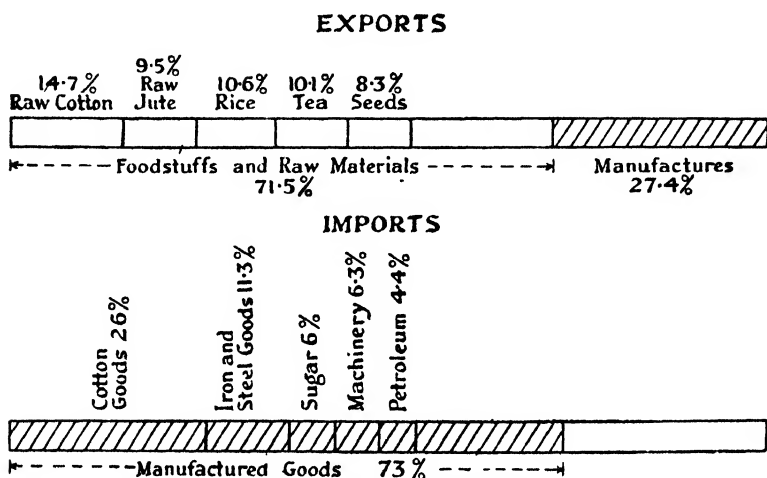


FIG. 56.—Trade of India.

tea, leather, raw cotton, raw and manufactured jute, wool wheat, and flax seeds.

THE PEOPLES OF INDIA

The earliest inhabitants of India were probably dark-skinned people. About 1600 B.C., light-coloured, nomadic herdsmen, the Aryans, started on the move from Central Asia. Some went west into Europe; others went south through the passes of the Hindu Kush to the hot plains of India, where they became the Hindus. The dark-skinned peoples to-day live chiefly in southern India. Again and again northern invaders came through the mountain passes. Mohammedan Turks and Mongols from Central Asia made themselves masters of northern India, and established the Moghul Empire.

After the Cape of Good Hope route to India was discovered, the Portuguese and the Dutch began to control the spice trade. In self-defence the East India Company was formed in London for trade with the East Indies. There were two routes from the Cape to India. The Portu-

guese route carried ships up the coast of Africa to Bombay ; the summer monsoon brought them to Madras and Calcutta.

Bombay was shut in between the sea and the Western Ghats ; Madras had strong native states as neighbours. It was, therefore, in the plain of the Ganges, where the Moghul Empire was falling into decay, that British influence most rapidly extended. In the wars that followed between the East India Company and rival French traders, the British fleets brought reinforcements from home for the British and prevented any reaching the French. Gradually all India and Burma were brought under British control.

The Indian Empire contains a population of 352,000,000, nearly one-fifth of all the people in the world. **British India**, which is governed by a Viceroy and an Indian Legislature under the control of the British Parliament, contains 60 per cent. of the whole area, and over three-quarters of the population. The rest of India forms **Indian States**, ruled by princes, who are subjects of the King-Emperor. British India is divided into nine larger and six smaller provinces. The most important are Bengal, the United Provinces, Madras, Bihar and Orissa, the Punjab, Bombay, the Central Provinces, and Burma. The chief Indian States are Hyderabad, Mysore, Kashmir, Gwalior, and Baroda. There are 222 different dialects and nine great religions, of which the two chief, Hinduism and Mohammedanism, include 68 per cent. and 22 per cent. respectively of the population.

British control over all India, the widespread use of the English language, and the bringing of far-separated districts into touch by railways and telegraphs, along with other factors, have caused the growth of the idea of a common Indian nationality amongst the peoples of India, in spite of their different races, religions, and speech, and to-day they desire to govern themselves. From a self-governing India it is possible that Burma would be excluded, because its people are Mongolian in race and Buddhists in religion.

(b) AFGHANISTAN

Afghanistan is an independent Mohammedan kingdom occupying an area larger than France, and forms a "buffer-state" between India and Soviet territory. One-quarter of the country in the south and west is desert, broken only by the Helmand river valley. Elsewhere it is mountainous, and includes the lofty range of the Hindu Kush. The rainfall rarely exceeds 20 inches annually; and the temperature of the areas over 3000 feet ranges from below zero in winter to 100° F. in summer. The inhabitants number about 8,000,000. They are settled mostly in walled villages in the river valleys, their chief wealth being flocks of sheep. **Kabul** (80,000 pop.), the capital, commands the northern end of the Khyber Pass.

(c) CEYLON

Ceylon is a pear-shaped island, 25,300 square miles in area (a little smaller than Ireland), which is separated from the apex of the Indian peninsula by Palk's Strait, 22 miles wide. Its population of 5,312,000 are chiefly Sinhalese by race and Buddhists by religion. Ceylon is practically in the centre of the Indian Ocean, a situation which gives it exceptional importance on shipping routes. Colombo (287,000), with a fine artificial harbour on the west coast, is a port of call on the Suez Canal routes to Australia and the Far East, and handles practically all the trade of Ceylon.

Most of the island is flat or gently undulating; but about a quarter of the whole area consists of a mountain mass in the south that rises to over 8000 feet. Its insular nature and its situation only 6° north of the Equator give Ceylon a climate more equatorial in character than that of India, with slight temperature variation; but nearness to the sea prevents heat so oppressive as in India. Rainfall is heaviest in the south-west and on the mountains. The north and south-east are dry, except in the Cold Weather Season (Nov. to Dec.).

About one-fifth of the island is cultivated, coco-nuts, rice, rubber, and tea being the chief crops. The low, wet country grows rice and coco-nuts on small native farms. **Tea** is cultivated on the hills, and **rubber** on the lowlands and lower hill slopes, mainly in the south-west. Both are "tropical plantation" crops, and form the principal exports, along with copra and coco-nut oil. Rice, cotton goods, sugar, coal, and manures, are the leading imports. Great Britain takes two-thirds of the exports, and supplies one-fifth of the imports.

EXERCISES III

A

1. On a blank map of India insert these names :
 - (a) Himalaya, West. Ghats, Hindu Kush, Vindhya ; Bay of Bengal, Palk Strait, Thar Desert, Afghanistan, Baluchistan.
 - (b) Trace the courses of these rivers : Indus-Sutlej, Ganges-Gogra-Jumna, Godaveri, Irrawaddy, Brahmaputra.
 - (c) Name these provinces : Punjab, Bengal, Hyderabad, Mysore, Kashmir, Nepal, United Provinces.
2. Insert on your map of India 5 seaports, 5 peninsular towns, and 5 towns of the Ganges valley.
3. When does the South-West Monsoon blow ? Which parts of India are affected most by it ? What advantages does it bring ? Are there any drawbacks ?
4. Name the three principal food crops of India. What other food crops are grown ? On your map print each name over an area of supply.
5. Where in India do you find : (a) desert, (b) tropical forest, (c) irrigation, (d) coal, (e) goats, (f) Mohammedans ?
6. In a sentence say what you know about : (a) Benares, (b) Delhi, (c) Deccan, (d) Sinhalese, (e) Peshawar.
7. What are the textile industries of India ? Where are they carried on ?
8. Explain : (a) buffer state, (b) Viceroy, (c) manganese, (d) gram, (e) long-stapled cotton, (f) alluvial plain.
9. (a) Which are the Tropical Monsoon Lands ? (b) Describe the three seasons of Monsoon Climate, and explain the difference between winter in Tropical Monsoon Lands and in Temperate Monsoon Lands.

B

1. Give good reasons why these crops are grown in the areas mentioned : (a) tea in Assam and Ceylon, (b) rice in the lower Ganges valley, (c) wheat in the Punjab.
2. Explain why the Monsoons (south-west and north-east) are reversed with the seasons.
3. Account for the importance of Calcutta, Madras, Rangoon, Kabul, Colombo, Lahore.
4. Say where the population in India is (a) dense, (b) moderate, (c) scanty. Give reasons for the distribution.
5. (a) In what occupations are British people engaged in India ?
(b) Why are the natives of India so disunited ?
(c) What dangers lie ahead when self-government is granted to India ?

THE INDO-CHINESE PENINSULA

The Indo-Malayan mountains curve south-eastward through the small islands of Singkep, Bangka, and Billiton (Belitong) into southern Borneo. In Siam, Burma, Malaya, and the three islands just mentioned, they contain the richest **tin deposits** in the world. Between them and the Alpine-Himalayan ranges in the west lie the oil-fields of Burma, Sumatra, Java, and Borneo.

Three great rivers—the Yangtze, the Mekong, and the Salween—rise near each other on the Tibetan Plateau and flow southward. The Yangtze soon turns east to the Pacific, but its two companions continue southward, the Salween entering the Gulf of Martaban as a river of Burma, while the Mekong descends to a wide delta on the South China Sea. Two smaller rivers, the Menam and the Songkai, or Red River, flow respectively to the Gulf of Siam and the Gulf of Tongking. Most of these rivers have rapids on their upper courses, and, above their deltas, are unsuited as highways for trade. In this peninsula man has as yet effectively occupied only the river plains, and even there is present in small enough numbers to make possible the export of **rice** to other lands. Dense forest, damp heat, and malaria preserve the rest for the beasts of the jungle, save where European enterprise has brought about the felling and export of **teak**..

(d) **SIAM**

The heart of this peninsula is Siam, which has an area of 200,000 square miles. and a population of 11,506,000. The Menam Basin (about 640 miles long by 150 broad) is the most important part of the country. Unlike the greater rivers which rise on the Tibetan Plateau, the Menam affords a water highway for 400 miles inland from **Bangkok**, the capital, which handles most of the trade of the country. The Menam is to Siam what the Nile is to Egypt—fertilising the soil yearly by its summer floods. **Rice** forms the food of the people and nearly two-thirds of the exports, other exports being tin and teak.

(e) **FRENCH INDO-CHINA**

To the east of Siam the S-shaped curve of the Annamese range is the backbone of the French colony of Indo-China, with an area of 285,000 square miles (approximately equal to France and Belgium), and a population of 20,500,000. Economically the whole falls into three divisions :

(1) **The hinterland of Saigon** (123,000 pop.), the commercial centre of the colony, lies east of the Mekong delta. This includes Cochin-China and Cambodia, and is one of the great rice districts of the world. Both the Mekong delta and Cambodia are fertilised with silt by the Mekong every year. Like Burma and Siam, Indo-China is a large exporter of rice.

(2) **The hinterland of Haiphong**, port of Hanoi (135,000), which is the capital of Indo-China. This area comprises Tongking and northern Annam. Mining for coal, zinc, iron, and phosphates is carried on ; the chief agricultural products are rice, maize, sugar, sweet potatoes, and raw silk.

(3) **The hinterland of Tourane**, the only harbour safe in all winds between the two river deltas, is central Annam. Here winter is the wet season because rain is brought by winds coming oversea, while summer rain is intercepted by the Annamese range. The wet season crop

is rice ; crops of the dry season are rice, sugar, and maize, grown on irrigated land.

(f) THE PHILIPPINE ISLANDS

The Philippine Islands stretch from south-east to north-west through 1000 miles of latitude. They include over 7000 islands with a total area of 114,000 square miles and a population of 12,000,000, chiefly of Malay race. The north-western islands have a dry winter and a wet summer and autumn, in which seasons rain is brought by tropical

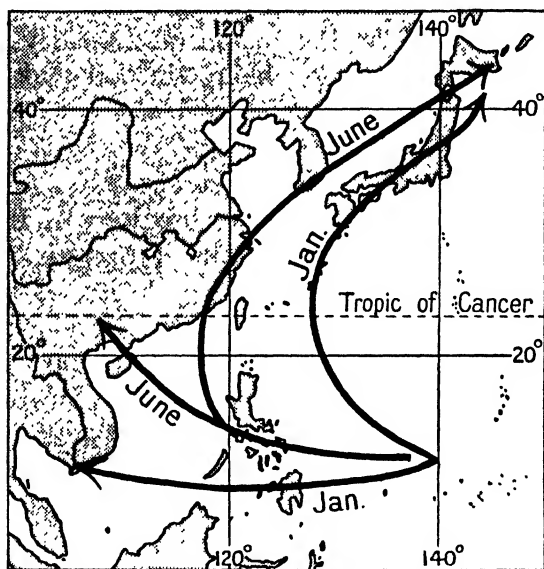


FIG. 57.—Some Tropical Cyclone Tracks of the China Sea.

cyclones (typhoons, Fig. 57). Their main crops are rice, maize, tobacco, and sugar cane. The south-eastern and central islands have some rain throughout the year, and mostly lie in summer outside the tracks of destructive typhoons. Their chief products are **coco-nuts** and **manila hemp**. The Philippines are one of the world's main sources of copra and coco-nut oil. As the islands belong to the United States, most of their trade takes place with that country, **Manila** (324,000), the capital on the island of Luzon, being the commercial centre.

THE EQUATORIAL LANDS

This region includes the Malay Peninsula south of the Isthmus of Kra, in 10° N., and the whole of the Eastern Archipelago. There is a high rainfall fairly evenly distributed over the whole year. The atmosphere is always damp and hot, temperature varying between 100° and 60° . Everywhere the natural vegetation is dense tropical forest, in which man, working inwards from the shores or river banks, has had to make his clearings. The people are chiefly Malays, who are keen fishermen and bold sailors, but do not take kindly to continuous agricultural labour. There has, therefore, been a large immigration of Chinese cultivators, artisans, and merchants into these lands. Crops for export are mainly grown on plantations under European management.

(a) **British Malaya and British Borneo.** The southern portion of the Malay Peninsula is divided between the **Federated Malay States**, five **unfederated Malay States** (both groups being under British protection), and the British colony of the **Straits Settlements** (Wellesley, Malacca, Penang, Singapore). The whole of British Malaya comprises an area of 52,000 square miles, with about 4,360,000 inhabitants. The north and north-west districts of Borneo (**British North Borneo, Brunei, Sarawak**) also form part of the British Empire. They contain 83,600 square miles (about one-quarter of the island) and 775,000 inhabitants.

The significance of Malaya is its production of **rubber**, more than half the world's supply coming from this area. Rubber plantations are on the western slopes of the central mountain spine of the peninsula, facing the quiet waters of Malacca Strait. The eastern slopes, facing the stormy South China Sea, are still largely forested and undeveloped. Rubber is also exported in less quantity from Borneo.

All the peoples of Malaya and Borneo are rice-eaters ; but the local crops are insufficient, so both countries are importers of rice. Coco-nuts and oil palms are cultivated

in Malaya in addition to rice ; Borneo produces sago and coco-nuts. Tobacco is much used by the natives, and is exported from Borneo, as also is timber, the island's greatest natural resource.

Malaya produces more than one-third of the world's **tin**. Sarawak has an increasing export of petroleum. The trade of all these countries centres upon **Singapore**, (557,000 pop.), an island joined by a causeway to the mainland, and possessing a fine anchorage and a wonderful position where trade routes from east and west meet at the south end of the Straits of Malacca. **Penang**, at the north end of the Strait, handles the local F.M.S. trade.

(b) **The Dutch East Indies.** The Dutch East Indies include the whole of the Eastern Archipelago except the British territories in Borneo. The largest islands are Sumatra, Java, Celebes, the Moluccas, (Southern) Borneo, and the western half of New Guinea. This eastern empire of Holland, in area (730,000 square miles) and population (60,000,000), is greater than any British tropical possession except India.

Java is as large as England. It belongs to the Alpine-Himalayan mountain system ; and volcanoes have burst out where folding has broken the earth's crust. A lofty backbone of mountains runs the whole length of the island. Its presence increases the rainfall, and supplies numberless streams to irrigate and renew the fertility of the plains with rich volcanic soil. As there is abundant sunshine, and temperature is much the same all the year round, crops can be planted at any season. Three crops a year are sometimes obtained.

All these factors enable the island to support a population of 41,719,000, much the same as that of England, although Java has no manufacturing industries. Except for the capital, **Batavia** (437,000), **Surabaya** (313,000), and about four other towns, the population is evenly distributed over the whole island, cultivation being pushed up the mountain-sides to the altitude of about 5000 feet. The density of 817 persons per square mile is the highest

in the world for a country dependent entirely upon agriculture, and is made possible only by the food value of **rice** (Fig. 8).

The great " money " crop of Java and the neighbouring island of Madura is **cane sugar** (Fig. 9), which is grown mainly on irrigated rice-land leased by natives to companies of planters, European or Chinese. Other plantation crops are coffee, in which the Indies rank third in world production, tea, rubber, and almost all the world's supply of quinine.

Except in Java, the resources of the Dutch East Indies remain largely undeveloped ; but exports from the other islands (the Outer Territories) have now begun to exceed those from Java. Conditions are favourable for cane sugar, coffee, tea, palm-oil, and pepper. Besides the large plantations in Java, even greater numbers of **rubber** trees are planted by natives on their small holdings and on cleared jungle land, chiefly in Sumatra, which yields 60 per cent. of the rubber output, Java furnishing 30 per cent. Sumatra exports less tobacco than Java, but Sumatran tobacco is a more valuable variety. Eastern Borneo and Sumatra yield petroleum ; and from the small islands of Singkep, Bangka, and Billiton comes about one-fifth of the world's **tin**.

EXERCISES IV

A

1. On a blank map of South-East Asia name :
 - (a) Siam, Cochin-China, Sumatra, Java, Borneo, Malaya, Sarawak.
 - (b) Trace the Salween and the Mekong ; Krakatoa, South China Sea, Strait of Malacca, the Equator.
 - (c) Bankgok, Singapore, Hanoi, Batavia, Penang, Labuan, Manila.
2. Name areas producing : tin, rice, petroleum, rubber, teak, quinine, silk, tobacco, hemp.
3. Singapore is situated at the crossing of routes. Name three of these routes (ports of departure and destination).
4. What are the chief resources of Java ? Why is it the most densely populated island of the East Indies ?

B

1. The area of Java and Madura is 51,000 square miles and their population is 42,000,000. The area of the South Island, New Zealand, is 58,000 square miles and its population 537,000. Explain why New Zealand has so much smaller a population.
2. Why do large areas of Indo-China and the Eastern Archipelago have little trade with other countries ?
3. On squared paper draw a diagram to represent (a) the relative areas of the Indian Empire, British Malaya, French Indo-China and the Philippines ; (b) the relative populations of same countries. Take one square to represent either 1,000,000 square miles or 1,000,000 inhabitants.

TEMPERATE MONSOON LANDS

As already stated (p. 198), the Temperate Monsoon Lands are distinguished from the Tropical Monsoon Lands by their much colder winters. The January isotherm for 32° F. cuts the coast-line of China south of the Shantung peninsula (Fig. 49), lying nearer the equator than in any other part of the world. Shanghai has a mean January temperature of only 37° F. China south of the South China Plateau has a Tropical Monsoon climate ; but we shall understand the geography of China best by considering the country as a whole.

In Japan the Temperate Monsoon climate is modified by the fact that the country is a group of islands. We noted Japan (Chapter I, p. 27) as one of the lands where cyclones give those changes in weather from day to day that favour human energy. Such changes are largely brought to Japan by tropical cyclones, which form over the Pacific Ocean to the east of the Philippines and travel west as destructive typhoons (Fig. 57). Some then curve north-eastwards over the China Sea, lose force, and bring to Japan summer storms followed by days of blue sky and cool winds that break the monotony of heat and moisture. In winter they give bracing weather. The warm Kuro Siwo ocean current flows northward from the China Sea, warming the winds that blow across it, and thus bringing to the southern

Japanese islands higher temperatures than their position in latitude would give.

China with its dependencies has an area of 4,277,000 square miles and a population estimated at 487,000,000. The Japanese Empire covers 260,000 square miles and contains 90,395,000 people. Together these Temperate Monsoon Lands occupy 8 per cent. of the area of the world, and yet hold 30 per cent. of its population.

(a) **JAPAN**

Through the two largest Japanese islands—Hokkaido and Honshu—runs a double chain of mountains, which divides in the north to form the mountains of Sakhalin (Karafuto) and the Kuril Islands, and in the south to form the south-western peninsula of Honshu and the islands of Shikoku and Kyushu. Between these two islands and Honshu is enclosed the Inland Sea.

The land area is roughly equal to three times that of England without Wales, two-thirds being mountainous. The highest peak is the beautiful Fuji-yama (12,395 feet). Large areas of the coastal plains are useless for agriculture owing to the rocky waste spread over them by mountain torrents ; and cultivated land is only 15·6 per cent. of the whole. The islands stand on the margin of the Tuscara Deep in the Pacific Ocean, and are frequently shaken by destructive earthquakes. The coast-line is broken into bays and headlands, which provide many harbours. As the cold Kamchatka current from Bering Strait meets the warm Kuro Siwo current on the continental shelf of north-eastern Asia, there are rich fishing-grounds near the coasts. Fish is a main article of food ; and 1,500,000 Japanese are engaged in **fishing**.

In this mountainous land, with only a small area available for crops, Japan supports 64,450,000 people, with a density of 437 to the square mile. The mountainous relief and heavy monsoon rainfall cover Japan with a network of small streams which are used to irrigate fields of **rice** on the coastal plains, while rice is also grown on terraces

on the uplands. Japanese agriculture is carried on almost entirely by hand labour, without machinery or animals, though Chilian nitrate and chemical fertilisers are used. All the cultivated land is needed to produce human food ; besides, the summers are too hot and moist to allow the growth of any except coarse, reedy grasses, unsuited for pasture. Rice forms most of the diet of millions of Japanese, though wheat, rye, barley, and tea are also cultivated.

Industries of Japan. All the peoples of Asia have felt the influence of the ideas, the inventions, the military and industrial power of " Western " countries, such as Great Britain, France, Holland, and the United States. The peoples of India and of China have, on the whole, been hostile to it, because it is quite different from their ways of living and thinking. The Japanese have welcomed it, and have become a nation of " Western " type.

Japan possesses a greater tonnage of merchant shipping than any other nation except Great Britain and the United States ; she has a powerful navy and army ; and she has become a manufacturing country, in spite of the fact that she requires to import many raw materials. She has coal-fields in Kyushu, Hokkaido, and Karafuto, and has so developed water power that she is the world's sixth largest user of electricity. Copper, however, is the only metal of which she has large supplies ; and iron ore has to be brought from Chosen, Manchuria, China, and Malaya. Her production of steel is only 6 per cent. of the output of the United States.

The most important industry is the manufacture of **textiles**. The mulberry can be planted in alternate rows with other crops, so Japan can supply the raw material for silk-reeling ; but nearly all the reeled silk is exported without undergoing any further process of manufacture. Raw cotton has to be imported for cotton-spinning ; and wool has to be purchased from Australia for the manufacture of woollens. The cotton industry of Japan is less important than that of India. On the other hand she has skilled

craftsmen who produce such "luxury" articles as pottery and lacquer ware.

Population, Cities, and Trade of Japan. Japan's great problem is the growth of her population, which increases by nearly 1,000,000 every year. She cannot bring under cultivation sufficient land to feed them; and she does not possess territories to which they can emigrate. She has acquired Taiwan (Formosa), Chosen (Korea), and southern Sakhalin (Karafuto), and administers the Marianne, Caroline, and Marshall Islands in the Pacific under Mandate from the League of Nations. But both Taiwan and Chosen

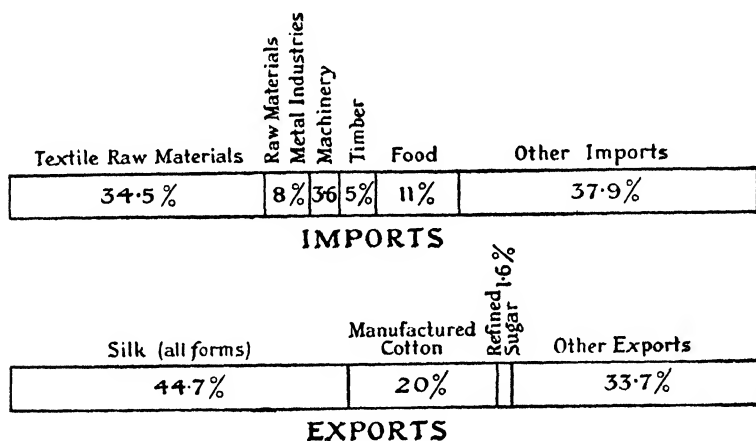


FIG. 58.—Trade of Japan.

are fairly densely populated, while Karafuto and even Hokkaido have winters too severe for the southern Japanese.

Taiwan (Formosa) supplies Japan with rice, and lies far enough south to grow sugar cane. **Chosen** produces silk and rice in the south-east of the peninsula near the port of Fusan, rice, cotton, winter barley, and wheat in the western lowland south of Seoul (Keijo), and spring barley and wheat north of Seoul. Gold, iron, and coal are mined in the north-west. The eastern coast-line along the Japan Sea has a fishing industry. But it is from the development of **Manchuria** that Japan hopes to obtain food for her population, raw materials for her factories, and a market

for her products which will enable her to employ greater numbers of her people in manufacture.

Tokyo (2,070,000 pop.), is the capital, situated at the seaward end of the only large area of plain. **Osaka** (2,453,000), on the Inland Sea with water transport for Kyushu coal, is the largest industrial city, **Kobe** (787,000) being the centre of the silk industry. Kobe and **Yokohama** (620,000) are the two chief ports, while **Nagasaki** (204,000) and **Hakodate** (197,000) respectively ship the coal of Kyushu and of Hokkaido.

Fig. 58 shows the general nature of the import and export trade, more than half of which is with the United States, China, and India.

(b) CHINA

China south of the Great Wall has an area of about 1,530,000 square miles, so that it is as large as India without Burma. It has a population estimated at 459,000,000, most densely settled in the Shantung Peninsula (614 per square mile). It is divided by the Tsin-ling Shan into Northern and Southern China.

(i) **Northern China** is the basin of the Hwang Ho. In the west mountainous country has been buried deeply in very fine yellow sand, carried by winds from the Gobi Desert, and turned into **loess Plateaus**. From this loess the Hwang Ho (Yellow River) has its name. East of these plateaus the rivers have laid down the alluvial soil, again mainly loess, that forms the **Great Plain**, which stretches round the eastern end of the Tsin-ling Shan to the Yangtze delta.

Loess is a fertile soil, because it contains mineral plant-foods, is easy to till, and is so porous that it can hold a great quantity of water. The plateaus are terraced as high as climatic conditions allow cultivation; but the forests have been cut down, so that heavy rains run rapidly off the higher ground, spreading gravel and stones over the fields. This waste material is also deposited in the beds of the rivers until they are raised above the level of the plains,

and are kept in their courses only by dykes. These frequently break, and disastrous floods occur, making the plains of Northern China the world's worst famine centre. Such a flood in 1852 led to the Hwang Ho changing its outlet from south to north of Shantung Peninsula.

Rice is cultivated as far north as Peiping, but the chief grain crops of Northern China are **spring wheat** and **millet**. Soya beans, ground-nuts, and sesamum are raised as oil-producing plants for human and animal food, and for manufacture. Pears, apples, and peaches are grown in Shantung and farther north. Cotton, hemp, and opium are also cultivated. The ox is used for ploughing; the mule, the horse, the donkey, and in parts the camel are the transport animals that travel the deep lanes, sunk into the loess. Sheep, goats, pigs, and poultry are widely distributed over all China.

(ii) **Southern China** is a mountainous country of river deltas, where transport is chiefly by water, and where the water-buffalo replaces the ox in the plough. The summer is slightly hotter than in Northern China, but the winter is much less cold, especially in the Si Kiang basin. It is a land of **rice, tea, silk, and sugar**, with rape instead of ground-nuts and soya beans, ramie instead of hemp, oranges instead of pears and apples, and in addition tobacco, tung-oil, and camphor.

The two great rivers are the Yangtze and the Si Kiang. For two-thirds of its course the Yangtze flows through highlands, leaving the mountains by great gorges at Ichang. The **Red Basin of Szechwan** (so called from its rocks of red sandstone) lies 120 miles above the gorges. It is well watered, and terraced to its hilltops for the cultivation of rice, tea, silk, tung-oil, and other crops. The Yangtze valley below the gorges is the rich **Central Basin of China**. Here cultivation is mainly of rice and the mulberry, although wheat, oil-bearing plants, and some hemp and cotton are also grown. The mulberry and cotton are raised in the Yangtze delta, crossed by canals in all directions, which forms part of the Great Plain.

The **Si Kiang basin**, south of the South China Plateau, is a tropical area where the chief crops are the mulberry, rice, and sugar cane. Tobacco, tea, and indigo, bananas, oranges, and pineapples are also cultivated, while the hill-sides have not, as elsewhere in China, been stripped of their timber.

Minerals, Communications, and Industries of China.

The development of China's large mineral resources has been slow, mainly because of the country's lack of railways. The centre of the railway system is **Peiping**, from which the following lines spread over China :

(i) Southward over the Great Plain to **Hankow**, and extending across the South China Plateau towards Canton as far as **Changsha**. This serves the **Yangtze valley steel and iron industry** with coal from the provinces of Hunan and Kiangsi. Iron is obtained from the Tayeh mines, and from others in the Yangtze valley. A branch line to Taiyuan taps important anthracite mines in Shansi.

(ii) By Tientsin to **Nanking** and **Shanghai**. A branch line runs from Tsinan to Tsingtao, which ships coal from the Shantung mines to Japan and the Yangtze delta. Iron ore mined near Nanking is also chiefly exported to Japan.

(iii) Westward by Kalgan to **Paotow** on the Hwang Ho in Inner Mongolia.

(iv) By Tientsin, north-eastward to **Moukden**, the railway centre of Manchuria.

Roads are of little use to feed or take the place of railways. They are never repaired, and in most places are mere tracks, along which goods are conveyed by cart, wheelbarrow, pack-animal, or porter. Waterways largely replace such tracks in Southern China, but these can mostly be used only by small sailing craft and motor-boats.

Electric power from imported coal, cheap labour, abundant raw cotton locally available, and closer contact with " Western " industrial methods than any other area have combined to make the **Yangtze delta** the great **cotton milling** district. Cotton is also manufactured in the Central Basin (Hankow), on the northern edge of the

Great Plain (Tientsin, Peiping), and in Shantung (Tsingtao). China probably produces more ginned cotton than any country in the world except the United States. **Flour-milling** is China's largest modern industry after cotton. It is centred at Shanghai and Wusih in the **Yangtze delta**, where nearly all imported wheat enters, and at **Tsinan** and **Tientsin**, because of their railway connections and their nearness to coal-fields and to the wheat areas of Northern China.

Most industries in China, however, are carried on in the cottages of the workers (*e.g.* hosiery knitting, wood carving, the making of paper fans and silk shawls), or in workshops that use no cheap power (*e.g.* the manufacture of porcelain, rugs and carpets, furs and leather).

Cities and Trade of China. Although China is a country of small farmers, or rather of gardeners, for half the farms are less than one and a half acres in extent, each country district has a large town as its centre.

Peiping (1,297,000 pop.), formerly Peking, was until 1928 the capital of China, and as such became the centre of its railway system. Its position at the north end of the Great Plain made it a "land port" for caravan routes across the desert to westward, well placed to control both Mongol and Manchu nomads in the north and Chinese cultivators in the south. **Tientsin** (1,388,000) is the port of Peiping, and has cotton and flour mills.

In Southern China, **Hankow** (777,000 with Wuchang and Hanyang) is an important industrial centre situated at the junction of the Han, its chief tributary, with the Yangtze. The Yangtze is navigable up to this point for ocean steamers, while the Han valley is the easiest line of communication with Sian in the Wei valley, on which routes converge from Central Asia. On the south the railway to Changsha runs up the Siang valley (Fig. 59). Farther down the Yangtze valley, **Nanking** (522,000), the capital of China, is more in touch than Peiping with all the areas of densest population, and **Shanghai** (2,674,000), 15 miles up the Whangpoo River from the estuary of the Yangtze, is the largest city in Asia.

Its harbour can be reached by the largest vessels, and it contains half the cotton spindles of China and large silk and tobacco industries.

The largest Chinese city of the Si Kiang basin is **Canton** (812,000), situated on the Canton River in the delta of the Si Kiang. Near the mouth of the Canton River the island

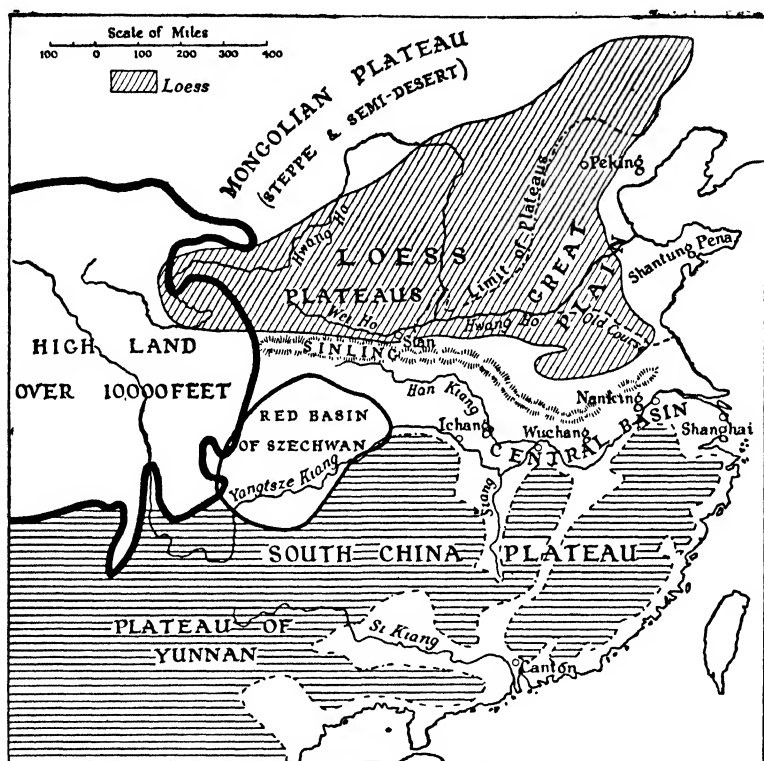


FIG. 59.—Natural Divisions of China.

of **Hong Kong** (840,000) has been a British possession since 1841. With Kowloon and other territory on the mainland leased from China it encloses a magnificent harbour, used by a greater tonnage of shipping than all the ports of the Union of South Africa.

The People of China. Great natural barriers of mountain, desert, and forest have allowed Chinese civilization to develop for many centuries on its own lines, until the

Chinese have acquired an outlook upon life which is entirely different from that of "Western" nations. This civilisation probably began in the valley of the Wei tributary of the Hwang Ho, whence it spread first eastwards to the Hwang Ho valley, then southwards to Southern China, always moving southwards, as population increased, towards warmer lands, and away from the desert. To-day this movement is being continued by the emigration of hundreds of thousands of Chinese from the over-populated Si Kiang basin to Indo-China, Malaya, Java, and the Pacific Islands.

The life of the Chinese centres round the family, the head of each family being responsible for all his household. This importance of the family has several consequences :

(i) It has brought China its enormous population, so that many districts are too densely settled, because their inhabitants are unwilling to leave their family farms.

(ii) The Chinese reverence their ancestors ; and the amount of land available for cultivation becomes steadily less because more and more of each family holding is taken up by the graves of the family.

(iii) Because of this devotion to their families, the Chinese have not the national patriotism of "Western" peoples ; and the various great centres of population, inadequately connected by roads and railways, are apt to follow each its local leader and its separate interests.

EXERCISES V

A

1. On a map of Japan insert these names :
Honshu, Kyushu, Hokkaido, Sakhalin, Shikoku, Kuril Islands, Kuro Siwo, Fuji-yama, Tokyo, Yokohama, Osaka, Nagasaki.
2. Explain : Kuro Siwo, typhoon, "westernisation," loess, sesamum, soya beans.
3. In what way does the climate of Japan differ from that of China ? Account for the difference.
4. What minerals has Japan within her own boundaries ? What minerals has she to import in large quantities ? Where does she obtain them ?

5. What goods are exported from (a) China to Japan, (b) Japan to China ?
6. On a blank map of China insert :
 - (a) The courses of the Hwang Ho, Yangtse, Si Kiang.
 - (b) The railway routes from Peiping to (i) Hankow, (ii) Shanghai, (iii) Paotow, (iv) Moukden.
 - (c) Peiping, Canton, Shanghai, Nanking, Tientsin.
7. In what parts of China are these obtained :
Cotton, coal, rice, barley, apples, silk, sugar, camphor ?
8. What is meant by the household industries of China ?
9. (a) Why has the Hwang Ho been named "China's Sorrow" ?
(b) What was the purpose of the Great Wall ?
(c) Why are there so many canals in China ?
(d) Why has progress been so slow in China ?

B

1. Why is the valley of the Yangtse the most important part of China ? What industry is carried on here ?
2. Explain the importance of Canton, Shanghai, Peiping.
3. Why does Japan seek colonies ? Where does she intend to get them ?
4. How far is it correct to describe Japan as "the Britain of the East" ?
5. Compare the climate of China with that of Eastern North America between the same latitudes, explaining (a) the factors which produce the rainfall of the two areas, (b) why snow falls at the sea-level nearer the Equator in China than anywhere else in the world.
6. Will the Pacific ever become a more important highway of traffic than the Atlantic ? Say why you think so.

(c) MANCHURIA

In addition to the spread of Chinese civilisation from Northern to Southern China, the empire of China was also extended northwards and westwards, over territories in Manchuria, Mongolia, Chinese Turkistan (Sinkiang), and Tibet, that are nearly twice as large as China south of the Great Wall. This was not a movement of colonisation ; it was undertaken to defend China proper against the peoples of the Central Asian grasslands—Huns (against whom the Great Wall was built), Mongols, and Manchus. In Mongolia, Turkistan, and Tibet, Chinese form only a small fraction of the population ; and although millions of

Chinese have settled in Manchuria, they are mainly not pioneers in search of new homes, such as colonised North America and Australia, but have left China as the only alternative to starving on their ancestral farms.

In Manchuria the old danger from the nomads of the grasslands has been replaced by fear of the Soviet Union and of Japan. Manchuria projects northward into Soviet territory, and is crossed by the Chinese Eastern Railway through **Harbin** to Vladivostok, this railway belonging to the Soviet. Japan has a lease from China of the southern extremity of the Liao-tung peninsula, with the harbours of Port Arthur and Dairen, and also of the South Manchurian Railway from Port Arthur through **Moukden** (250,000 pop.) to Changchun.

Manchuria has an area of about 500,000 square miles, and a population of about 34,000,000. Between the East Manchurian mountains in the east and the Khingan mountains in the west and north lies a wide, level, treeless plain, stretching from the Gulf of Liao-tung to the Amur River, and drained southward by the Liao, northward by the Sungari, a tributary of the Amur. The climate of this plain resembles that of the Great Plains in Canada. During four to six months the rivers are frozen; the growing season is limited to six months at best, when the rain-bearing monsoon winds sweep in from the ocean.

Agriculture is the source of three-fourths of Manchuria's products, although 40 per cent. of the land thought to be suitable for cultivation is still unsettled. As the farmers are chiefly from Northern China, and the two climates are much alike, crops similar to those of Northern China are raised, grain and beans being hauled to rail-head or river bank in winter over the frost-bound ground. South of the Sungari River there are on an average 150 days in the year without frost. **Kaoliang** (a drought-resisting variety of wheat), which is the main food of the farmers, is important in this area. Here also maize and Italian millet are grown. **Soya beans**, which form the great export crop, can mature in a cooler climate, and

extend farther north than Kaoliang, while spring wheat is also a northern crop. Manchuria raises 63 per cent. of the world's soya beans.

Manchuria produces one-half of the **iron ore** and one-third of the **coal** of China. Both industries are operated by the South Manchurian Railway for export to Japan and Southern China.

(d) **THE HIGH PLATEAUS OF EASTERN ASIA**

(i) **Tibet** lies between the Himalayas and the Kunlun. Most of its 2,000,000 inhabitants live in the valleys of the Indus, Sutlej, and Tsangpo (Brahmaputra) in the less elevated southern part of the country. All the chief monastic towns and trade centres, such as **Lhasa** the capital, are situated on the Tsangpo or its tributaries. Tibet is now practically independent of China.

(ii) **Sinkiang** (Chinese Turkistan) consists of the **Tarim** and **Dzungarian Basins**. Much of it is desert ; but modern methods of agriculture and irrigation would allow of a larger population than it now contains. Both basins are traversed by historic trade routes from China :

- (a) The Silk Trade route led through the Tarim Basin to Kashgar and Yarkand oases, thence over the Pamir passes to Balkh and Mesopotamia ;
- (b) Northern routes through the Dzungarian Gate at the west end of the Dzungarian Basin led by Khiva and Bukhara to Persia and Anatolia.

The Turksib Railway runs for 500 miles parallel to the western border of Sinkiang through Soviet territory, the inhabitants of which are closely connected with those of Sinkiang by race, religion (Mohammedanism), and trade. The influence of the Soviet Union is likely to increase in Sinkiang, the capital of which (Urumchi) is 75 days distant across arid country from Peiping.

(iii) **Mongolia** is a great plateau between the Altai and Sayan mountains on the west and the Khingan mountains on the east. As the Khingan catches most of the rain brought by the monsoon winds from the Pacific, the

centre of this plateau is occupied by the great Gobi Desert, north of which lies **Outer Mongolia** and south of it **Inner Mongolia**. The climate is hot and dry in summer, and bitterly cold in winter, when the temperature sometimes falls to 50° below zero. Outer Mongolia is a republic under the influence of the Soviet Union. Its Mongol and Kalmuck inhabitants are nomadic tent-dwellers and herders of cattle; and the products of this area are wool, meat, hides, milk, and cheese. Inner Mongolia contains fertile valleys which receive some moisture from the monsoon winds. Here the Mongols are being replaced by Chinese farmers along the Peiping-Paotow railway and on the alluvial land round the Ordos loop of the Hwang Ho.

THE NORTHERN LOWLAND

The Northern Lowland and the East Siberian mountains form the Asiatic territory of the Union of Socialist Soviet Republics. The Soviet Union is a federation of different peoples, in which the dominant member is the Russian Socialist Federal Soviet Republic. Most of Soviet Asia belongs to the R.S.F.S.R. Relatively advanced peoples form the republics of Transcaucasia, Turkmenistan, Uzbekistan, and Tajikistan.

The rivers of Siberia—the northern part of the Lowland—flow slowly, because the slope of the land towards the Arctic Ocean is very gradual; and they are frozen for at least five months every year. Only the Amur, which has a swifter current, and drains to the Pacific, is of much service for transport. The Plateaus of Eastern and Western Asia prevent easy communication with the Near East and the Monsoon Lands. Railways are therefore essential to convey the products of Siberia and Turkistan to the European territory of the Soviet Union. The Trans-Siberian Railway—the longest line in the world, 5400 miles from the Baltic to the Pacific—crosses Siberia to Vladivostok. Turkistan has two railway connections with Europe; and the Turksib railway (Turkistan-Siberia) has recently provided a link east of Lake Balkhash between Tashkent and the Trans-Siberian line.

The Soviet government plans to develop the resources of their territory so that each area may contribute the products it is best suited to supply. **Western Siberia** is mainly **agricultural**. The different vegetation belts are shown in Fig. 60.

The small population of the **Northern Forest** in Asia and the difficulties of transport have left its timber resources as yet little utilised. The **Grasslands** are primarily a **wheat** region. They cover nearly 1,000,000 square miles in Europe and Asia, and are divided into a northern **Black Earth belt** (p. 115), where the rainfall is between 16 and

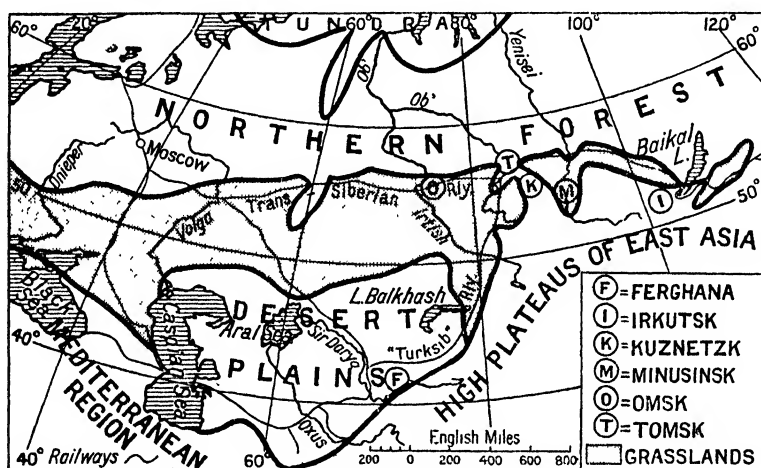


FIG. 60.—Vegetation Belts in Soviet Asia.

20 inches in the year (now all under cultivation), and a southern belt of less fertile Chestnut-Brown soils, in parts of which the rainfall is less than 10 inches, and where large areas are still used for grazing stock on the natural grass. As the surface is generally level, ploughing, sowing, and harvesting can be carried on cheaply with machines.

The **Desert Plains** are not productive without irrigation. This has been practised for centuries along their southern margin. The **Plain of Ferghana** north of the Altai mountains, watered by the upper course of the Sir Darya River, raises **cotton** on land which formerly grew wheat, as the Turksib railway can bring wheat to Ferghana

from the north. Although fertile areas occupy only 15 per cent. of Turkistan, there are surprisingly large trade centres, such as Samarquand (105,000), Khoqand, and Tashkent (402,000).

The **Mediterranean Region** is the trough between the Caucasus mountains and those of the Armenian Knot. It has an ample rainfall and a mild climate favourable to the growth of wheat, maize, early vegetables, Mediterranean fruits, and even of tea, for which there is a great demand in the Soviet Union.

The chief **mineral-producing** areas are in **Eastern Siberia** and **Transcaucasia**. **Coal** is mined in Sakhalin, at Suchan east of Vladivostok, and in the Irkutsk and Kuznetzk coal-fields (Fig. 60). **Iron** comes from the coast of the Japan Sea north-east of Vladivostok, from Minusinsk in the upper Yenisei valley, and from Kuznetzk. Tin, zinc, lead, copper, and silver are mined in several localities, while **gold-mining**, the largest of the mining industries, is widely distributed throughout eastern Siberia.

The chief mineral product of Transcaucasia is **petroleum**, which is yielded by the oil-fields that lie both north and south of the Caucasus mountains, especially by those round **Baku** (452,000 pop.) on the Caspian and by the Maikop oil-field in the west. Western Transcaucasia also yields about half the world's **manganese ore**.

EXERCISES VI

A

1. On a blank map of Northern Asia insert :
 - (a) The courses of the Ob', Irtysh, Yenisei, Amur.
 - (b) The route of the Trans-Siberian Railway, naming : Moscow, Omsk, Tomsk, Irkutsk, Harbin, Vladivostok, Port Arthur.
 - (c) Lhasa, Bukhara, Samarquand, Tashkent.
2. Where in this part of Asia is agriculture (a) successful, (b) difficult ? In what two regions is mining important ? Name the chief minerals obtained.
3. What factors have delayed development in the production of grain and timber in Siberia ?

B

1. In what ways might the development of Manchuria be expected to help to solve the over-population of Japan ?
2. Why is this part of Asia much less important than the rest of the continent ?
3. How would you account for the following annual rainfalls ?—
 - (a) Gibraltar 36 inches, Malta 18 inches, Cyprus 8 inches, Egypt $1\frac{1}{2}$ inches, Mesopotamia, 0.
 - (b) Greenock $61\frac{1}{2}$ inches, Memel 25 inches, Moscow 17 inches, Omsk 9 inches.

CHAPTER IX

EUROPE: THE STIMULUS OF POSITION, RELIEF, AND CLIMATE

HIGHLANDS AND LOWLANDS

EUROPE is a peninsula of the Old World. It projects westwards from Asia, and is separated from Africa by the Mediterranean Sea. Its area is about one-third of that of Africa, but it contains one quarter of the population of the world. It has three mountain systems and one great plain.

(i) **The North-west Core of Old Rocks.** Europe has been built up on the southern margin of a region of very ancient rocks in the north-west of the continent. This Core includes the Scandinavian highland, which is the greatest mountain area in the continent, and the highlands of the British Isles, but contains also much low-lying land.

(ii) **The Central Hercynian Highlands.** The Hercynian mountains once stretched across Europe south of the ancient Core. They were broken into isolated blocks of plateau by the earth movements which folded the Alpine-Himalayan mountains. As the rocks of these plateaus (Fig. 61) are hard, they are slow to crumble under the influence of air and water, and are in consequence areas of thin, poor soil, and scanty vegetation. They are, therefore, in general sparsely populated. Along their fractured margins, however, hot springs have deposited nearly all the useful metals, and their northern edges are marked by a line of coal-fields, from Silesia through the Ruhr and Belgium to South Wales, formed on the marshy deltas of rivers which flowed northward from the mountains. For this reason these Hercynian plateaus are surrounded by industrial and mining areas with large populations.

(iii) **The Alpine Folded Mountains.** These are continuous with the Alpine-Himalayan mountains in Asia. Compared with the broad Hercynian plateaus of moderate altitude, they are narrow and lofty. They spread out westwards and eastwards from the Swiss Knot between the Hercynian Highlands and the Northern Plateau of Africa (p. 138).

The western folds (Apennines, Atlas, and Spanish ranges) loop round the western basin of the Mediterranean

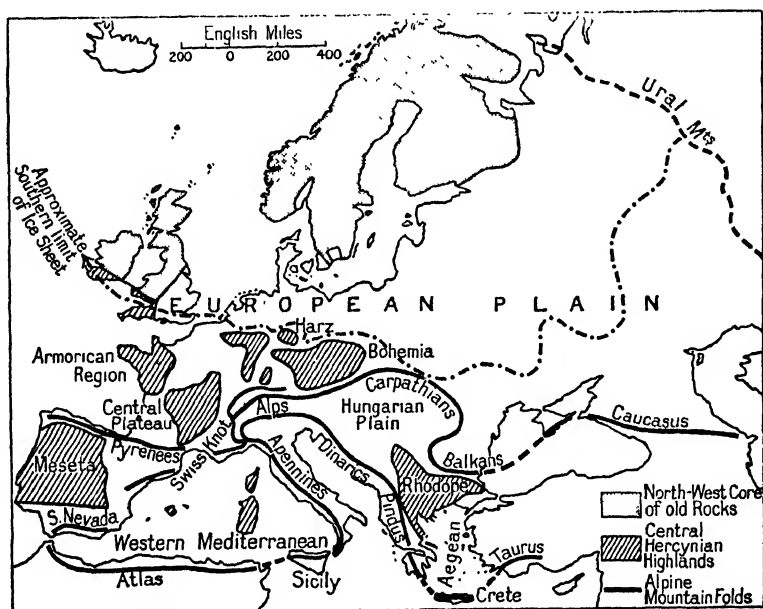


FIG. 61.—The Structure of Europe,

Sea instead of round plateaus as in Western Asia. They enclose the islands of Corsica and Sardinia, which are a part of the Hercynian mountains that survived the upraising of the Alpine system. The eastern folds (Carpathians-Balkans and Dinarics-Pindus) loop round the Hungarian Plain, the Hercynian plateau of the Rhodope mountains, and the water basin of the Ægean Sea.

Notice in Fig. 61 that the western loop is much more broken than the eastern. This gives the lands of the western basin a closer connection with central and northern

Europe than the lands round the Ægean Sea possess. The eastern Mediterranean basin lies south of the Alpine folds, which pass through the island of Crete into Anatolia. The hidden forces in the depths of the earth which created the Alpine mountains have not altogether ceased their activity. They still devastate Crete, Sicily, and southern Italy with earthquakes, and break out in the volcanic eruptions of Etna and Vesuvius.

(iv) **The European Plain.** This is continuous, south of the Ural mountains, with the Northern Lowland of Asia (Fig. 48), the whole area being termed the Eurasian Plain. The European Plain was once a broad trough between the highlands of the Core and the Hercynian mountains. This trough was filled with alluvial soil brought down by their rivers. To-day the surface of the Plain is so level that one can travel across it, from south-west France to north-east Russia, without rising 600 feet above the sea. Its fertility has been increased in certain areas by the laying-down of boulder-clay by a great Ice Sheet, which thousands of years ago covered northern Europe (Fig. 61), as a similar Ice Sheet covered North America (p. 96), and carried southward mud, sand, and boulders from the Scandinavian highland. Elsewhere, after the coming of a warmer climate, the finer soil left by the glaciers was swept up by wind and deposited as beds of fertile loess.

This fertility of soil, the easy communications given by the level surface, and the minerals along the northern margin of the Hercynian mountains have favoured the agricultural and industrial development of the European Plain, so that it is densely populated and contains many great cities, including London, Paris, Berlin, and Moscow.

TYPES OF COAST

(i) **North-western Europe**, which was covered by the Ice Sheet, has coasts broken by long, narrow, steep-sided sea lochs called **fiords**. These have been deepened by glaciers. In most cases the deepest part of the loch lies

near its head, and there is shallower water at its outlet to the sea.

(2) In south-west Ireland, western England, Brittany, and the Iberian peninsula, the coast-line of **Western Europe** has sunk, so that the sea has penetrated inland up former river valleys. Such inlets, called **rias**, are broad with sloping sides, like a normal river valley, and deepen from the head to the outlet.

Both fiord-coasts and ria-coasts provide excellent harbours for fishermen and seamen. The men of Norway, Devon, Brittany, Spain, and Portugal have been amongst the great explorers of the world.

(3) **The Mediterranean Sea** is almost tideless, and, because of the intense evaporation which takes place during summer, its waters are saltier than those of the oceans. Through the Strait of Gibraltar it receives less salt water from the Atlantic, and through the Bosphorus and Dardanelles it receives fresh water from the rivers which flow into the Black Sea. Thus surface currents flow eastwards along the coast of Africa and westwards along the southern coasts of Europe.

The mountains lie so close to the coasts that rivers in this region have generally short courses. The absence of tides enables the larger rivers to form **deltas**, from which sand is carried by the currents, and built up as sand-banks that enclose **lagoons**. The valley of the river that has built the delta is usually a fertile area that requires a port at its mouth, such a harbour always being situated on that side of the delta where it cannot be silted up by the current-borne sand. For this reason Marseilles is placed east of the Rhône, Barcelona north of the Ebro, Venice north of the Po, and Alexandria west of the Nile.

Another type of coast in the Mediterranean occurs where spurs of the mountains run out into the sea as **promontories and islands**. This type is specially characteristic of the Ægean Sea, where Crete-Rhodes, the Cyclades, and the Sporades-Lemnos form three strings of islands between Greece and Anatolia, encouraging cross

traffic between settlements in the little valleys between the mountain spurs on these two coasts.

(4) The coasts of the **European Plain** are much less broken by inlets than any of these other types. On the other hand, they include the **estuaries of many great rivers**, which, west of Jutland peninsula, are kept scoured for shipping by the powerful tides that set and ebb twice daily across the Continental Shelf, and that carry vessels far inland. On these **North Sea** estuaries, therefore, are situated great commercial ports, such as London, Hamburg, and Antwerp, which are in direct communication with densely populated areas of the European Plain.

East of Jutland peninsula the **Baltic Sea** is shallow, because it is merely a submerged portion of the Plain; and so many large rivers discharge into its almost land-locked basin that its water is less salt than that of the North Sea. Baltic ports of the Plain, which mostly lie some distance up the estuaries of the rivers, are therefore liable in winter to be blocked for weeks by ice. In the eastern Baltic an eastwards-flowing current has built up *Nehrungs*, or **sand-bars**, that enclose haffs, or **lagoons**. These tend to be turned into fresh-water lakes by the silt of the rivers, and in time to be filled up altogether. Shipping can reach Königsberg on the Frisches Haff only through a canal.

CLIMATE

Fig. 4 shows that the countries bordering the Mediterranean Sea are mainly in the North Warm Temperate Region, while the rest of the continent is in the North Cool Temperate Region. We have already noted in Chapter I (p. 22) the **warming effect in winter of the Westerly Winds** which blow over the warm Gulf Stream Drift. This causes what is called the **Winter Gulf of Warmth** to extend far up the coast of Norway, and makes the January isotherm of 30° F. run from north to south over north and central Europe (Fig. 62). In southern Europe the **warming effect of the Mediterranean Sea** causes the January

isotherm of 50° F. to run approximately from west to east along the 40th degree of latitude, several degrees farther north than this temperature occurs in Asia and North America.

In **summer direct sunshine** has more effect ; and isotherms run approximately from west to east across the continent, temperature decreasing from 76° F. at Palermo, in Sicily, to 50° at the North Cape, in Norway. Notice, however, in Fig. 62, the **cooling influence of the water basins** upon their coastlands, causing a southward curve of the isotherm of 60° F. over the Irish, North, and Baltic

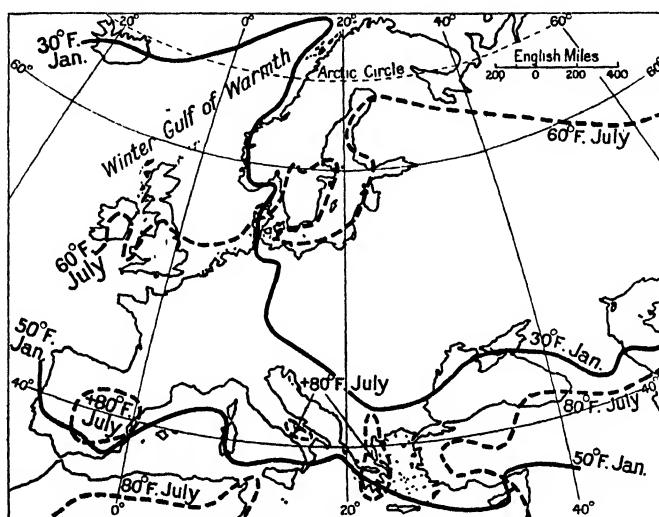


FIG. 62.—Europe : January and July Temperatures.

Seas, and restricting a temperature over 80° F. to the southern portions of the three peninsulas in the Mediterranean.

Four factors affect the **rainfall** of Europe :

- (1) There is a flow of moist, warm air as **south-west winds** from the centre of High Pressure over the North Atlantic near the Azores (Fig. 24) towards the west coasts of the continent. The Azores High Pressure centre has its greatest effect in summer. When this flow of air is the chief

climatic influence, rainfall in Western Europe is orographical, and the highest land receives the greatest amount of moisture.

- (2) Rain is also brought by **cyclones**, from which Western Europe and (in winter only) the Mediterranean lands receive much of their rain, which is distributed almost irrespective of local differences of surface.
- (3) In summer the prevailing winds in the Mediterranean lands are the **North-east Trades**. These are dry because they arrive across land, so that summer in these lands is a time of drought.
- (4) **In winter, heavy cold air from Central Asia** spreads westwards over Europe, frequently over Germany and France and even over the eastern part of Great Britain, and "fends" off the rain-bringing cyclones. The interior of the continent in winter thus has calm weather with little rain.

These factors controlling temperature and rainfall produce **three main climatic regions** :

- (1) **Maritime Climate** in Western Europe, where the latitudes are Cool Temperate, but, because these lands lie near the Atlantic Ocean, the prevailing south-westerly winds modify both winter cold and summer heat so that the range of temperature is much less than in the interior of the continent. The average January temperature of London is 39° F. ; the average July temperature is 63° F. Rainfall is plentiful, and distributed throughout the year. In the west of this region there is a heavier rainfall in the six winter months than in the summer half-year.
- (2) **Mediterranean Climate** in Southern Europe, where the latitudes are Warm Temperate, but the Mediterranean and Black Seas render the climate cooler in summer, milder in winter, than, but for their influence, it would be. Summer is

warm and rainless. In winter come showers of rain, which decrease towards the south and east, with the lessened ability of the cyclones to penetrate in and (Nice, 33·7 inches ; Athens, 15·4 inches ; Biskra, Algeria, 8 inches) ; between these showers there is bright and sunny weather. The three peninsulas (Iberian, Italian, Balkan) enjoy 2500 hours of sunshine in the year, whereas in the British Isles the maximum is about 1500. As a whole, rainfall tends to be scanty in view of the fact that the high temperature causes considerable evaporation.

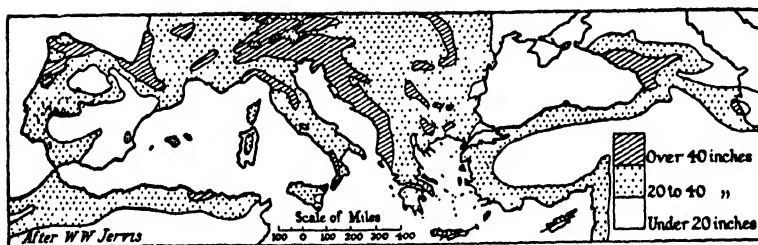


FIG. 63.—Southern Europe : Annual Rainfall.

- (3) **Continental Climate** prevails over central and eastern Europe, because these regions are too far inland to experience the moderating influences brought by winds from the sea. There is a great range of temperature between winter and summer. The average January temperature of Moscow is 13° F. ; the average July temperature is 66° F. Winter is cold and calm, with little snow or rain. In summer cyclones travel far inland ; but most of the rainfall is due to heating up of the land surface in the daytime, and to the fall of the moisture thus evaporated as rain in thunderstorms or at night. Rainfall is generally scanty, decreasing eastward with distance from the sea (Fig. 63).

NATURAL VEGETATION AND ITS REPLACEMENT

Most of Europe has rainfall and temperature that are suitable for tree growth. Before the beginnings of history there stretched right across the continent a wide belt of broad-leaved deciduous **Temperate Forest**. As the rainfall comes at seasons suitable to the cultivation of cereals and other crops, most of this forest has been cleared for agriculture. Northward the zone of deciduous forest gives place to cone-bearing forest, more resistant to cold, and still farther north to **Tundra**.

In Southern Europe man has continuously aimed at raising cereals, and at replacing other trees by those which are specially useful to him, such as the olive, and, in cooler and damper areas, the hardier vine, fig, and walnut. He has also needed much timber for fuel and building. Thus the **evergreen forests** of the lowlands and the deciduous forests of the hill slopes have both largely disappeared. Only the coniferous forests of the mountains have been preserved; and even these have in many places been cleared to supply alpine pasture. Land which has gone out of cultivation has become covered with stunted "maquis" shrubs.

Temperate Grassland extends from Asia between the Caspian Sea and the Ural mountains into southern Russia, where the rainfall is less than 20 inches in the year. Following this belt of grassland, nomadic herding peoples from Asia penetrated to the heart of Europe.

THE PEOPLES OF EUROPE

The peoples of modern Europe are chiefly descended from three great branches of the white race of mankind.

- (1) The **Mediterranean Race** had its home in the lands round the Mediterranean Sea, where the warmth and sunlight produced dark hair and eyes and olive-tinted skin, and brought boys and girls early to manhood and womanhood. This shortened the years that they continued growth, and gave

them only moderate height. The Greeks, the southern Italians, the southern French, the Spaniards, and the Portuguese largely belong to this race.

- (2) The home of the **Nordic Race** was the lands round the **Baltic Sea**, less sunny and more densely forested than the Mediterranean lands ; for which reasons, probably, Nordic man became clear-skinned, with fair hair and blue eyes. Leading a hunting life in a cool climate, he was late in reaching manhood, and had many years of growth in which he became tall and muscular. The Scandinavians, the Germans, the northern French, and the English belong by origin to the Nordic Race.
- (3) The home of the **Alpine Race** may perhaps have been Anatolia. People of this race are distinguished by a thick-set build, medium height, straight brown or chestnut hair, and rather a broad nose. Their heads are rounder than those of the other two races. The Alpine Race spread from east to west along the **central highlands** of Europe, and is represented by the different Slav peoples, and by the southern German peoples. All the European nations, however, probably contain amongst their population descendants of all three races.

EXERCISES I

A

1. On a blank map of Europe insert these names : Cantabrian Mountains, Sierra Nevada, Apennines, Carpathians, Central Plateau (France), Scandinavian Highland, Hungarian Plain ; the Baltic, Ægean, Black, White, Caspian, North Seas.
2. Be able to point the names on your map : Silesia, Ruhr, Vesuvius, Etna, Moscow, the Mediterranean Islands, Dinaric-Pindus ranges, Brittany, the countries of Europe.
3. Explain and exemplify : ria, fiord, glacier, promontory, volcano, lagoon.

4. Say what differences you have noted between the Alpine and Hercynian Mountains in respect of (a) structure, (b) position, (c) altitude.
5. (a) Where do the main deposits of useful metals in Europe lie ?
 (b) What traces of the former Ice Sheet are still to be found in Europe ?
 (c) Why are the waters of the Mediterranean Sea saltier than those of the oceans ?
 (d) Why do most rivers flowing to the Mediterranean Sea have such short courses ?
 (e) Explain clearly where on the delta of its river each of these towns stands ; give reasons for the position : Venice, Alexandria, Marseilles.
 (f) Why are the greatest shipping ports to be found on the coasts of the European Plain ?
 (g) Why is the Baltic of little use for navigation ?
6. (a) What effect has the sea upon the climate of lands bordering it ?
 (b) Name some land affected and compare it with some other inland in the same latitude.
 (c) What lands of Europe are affected by the North-east Trade Winds ?
 (d) What part of the Continent has in winter calm weather with little rain ?
7. Explain : tundra, coniferous, deciduous, steppe.

B

1. Which of the main physical features of Europe are continued in (a) Asia, (b) Africa ?
2. Explain these terms : Maritime Climate, Mediterranean Climate, Continental Climate.
3. What effects upon the Mediterranean has the inflow of water of the Atlantic and the Black Sea ?
4. In three columns (Mediterranean, Nordic, Alpine) tabulate the general physical characteristics of the people of the three races.

THE MEDITERRANEAN LANDS

The Mediterranean type of climate and its typical drought-resisting vegetation are found in the Iberian, Italian, and Balkan peninsulas, which contain about 91,000,000 people. This climate does not prevail over the

whole area of any one of these peninsulas ; nor is it confined to these lands in this part of the world, for it occurs in the south of France in Europe, in south-western Asia (p. 205) and in northern Africa (p. 141). The countries round the Mediterranean Sea form the largest region anywhere that experiences a climate of winter rain and summer drought. There man learned how best to use the natural resources provided by this climate, which is so warm and sunny that

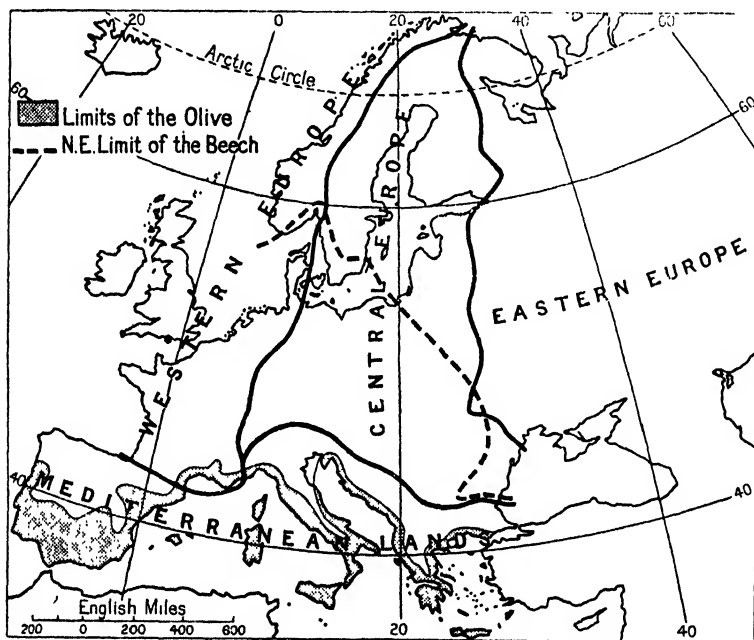


FIG. 64.—Regions of Europe.

some product of value can be obtained from the land at all seasons of the year.

Wheat and barley, sown in autumn and nourished by the winter rains, ripen for harvest in early summer. The vine supplies ripe grapes in autumn for wine to make good the shortage of drinking water during the summer drought ; in winter the olive-harvest gives oil to take the place of butter and cheese, because there is only scanty pasture, and cattle are kept for draught rather than for dairy produce. These four crops made civilisation possible in the

Mediterranean region in early times, and still form the main diet of Mediterranean peoples.

Irrigation has made possible the introduction of other crops from regions of summer rain, such as the peach, citrus fruits, rice, cotton, and the mulberry. The fact that highlands lie close to the lowlands in many districts also allows the practice of "transhumance," that is, the driving of stock from winter pastures, which become parched in summer, to mountain pastures, which at that season are fresh and green. In manufacturing industry the Mediterranean peoples have developed during thousands of years a tradition of careful and skilled workmanship, employed on a relatively small amount of raw materials, which enables them to specialise in the production of high-class articles, such as lace and silk.

(a) **THE ITALIAN PENINSULA**

Italy falls naturally into the three divisions of :

- (1) the **northern plain**, drained by the river Po ;
- (2) the narrow **peninsula**, through which run the Apennines ; and
- (3) the large **islands of Sicily and Sardinia** (the island of Corsica being French).

Climatically peninsular Italy, Sardinia, and Sicily have the Mediterranean type of climate. The northern plain has a more continental climate. Milan has an annual range of 40° of temperature ; and the typically Mediterranean olive tree will not grow in the plain, except in a sheltered district at the foot of the Alps round the Italian lakes.

Italy also contains smaller districts with special characteristics of their own. The northern plain slopes eastwards from the uplands of **Piedmont** through the **Plain of Lombardy** to the coastlands of **Venetia**. West of the Apennines the broken coastal plain of **Liguria** is succeeded by the hills and valleys of **Tuscany**, the flat Roman **Campagna**, and the wide bays of the plain of **Campania** around Naples.

Italy has an area of 119,000 square miles and a population of 41,220,000, roughly equal to the area and population of the British Isles. Good harbours are scarce, the west coast, with its islands, bays, and coastal plains, being much more favoured than the east coast, where southward of Rimini the Apennines slope steeply to the sea. The mail and passenger port of **Brindisi** is the only harbour of importance between Venice and Taranto. The length of the peninsula (700 miles), more than four times its average breadth, and the fact that it is traversed by the Apennines, long made difficult the control of Italy from a single centre till the Romans constructed a network of roads.

On the north, Italy is cut off from Europe by the Alps, which curve from the Gulf of Genoa nearly to the head of the Adriatic. In the north-west, the Italian frontier approximately follows the crest-line, passing through **Mont Blanc** (15,782 feet), the **Matterhorn** (14,705 feet), and **Monte Rosa** (15,219 feet). In the centre Swiss territory projects southward into the region of the Italian Lakes. In the Eastern Alps the Italian frontier is established on the main water-parting, in order to secure the **Brenner Pass**, which by a low saddle unites the valleys of the Inn and Adige.

The Alps have given protection to Italy; but such protection has never been complete. They are concave towards Italy, so that across Europe "all roads lead to Rome," and slope more gradually northward than to the south, where, except in the neighbourhood of the Brenner, they rise abruptly from the basin of the Po. Important Alpine passes, in addition to the Brenner, which are followed by lines of railway, are those of **Mt. Cenis**, **Simplon**, and **St. Gotthard**. The **Great St. Bernard** pass is crossed only by road. Round each end of the chain communication is also fairly easy.

AGRICULTURE IN ITALY

More than half the workers of Italy are engaged in agriculture. In **peninsular Italy** and **Sicily** cultivation of **the olive and the vine** is of first importance, although

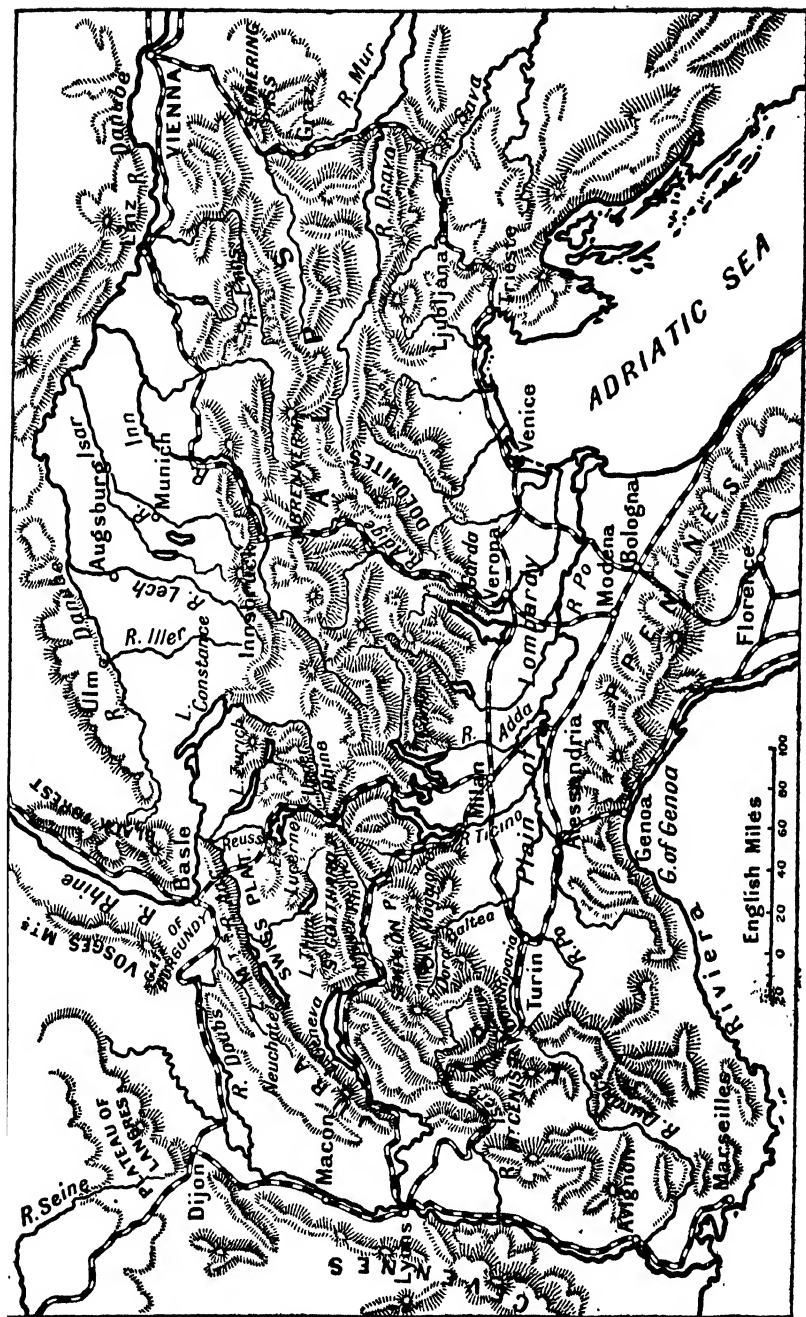


FIG. 65.—The Alps and Northern Italy.

citrus fruits take their place in some south-western districts, such as the neighbourhood of Palermo and that of Messina, on the strait between Italy and Sicily. The large amount of bright sunshine, the high autumn temperature (October is warmer at Palermo than July is at Paris), and the abundance of cheap labour make Italy the largest wine-producing country after France. The peninsula and Sicily also raise **wheat**, in greater quantity than Argentina. This is grown for straw-plaiting in Tuscany and for the manufacture of macaroni in drier southern districts. The chestnut tree yields food, while the walnut and cypress supply timber.

The **northern plain** has sufficient pasture in the water-meadows along the banks of its rivers for **dairy cattle**, of which the milk is made into Parmesan and Gorgonzola cheese. The place of the olive and the vine is taken by the mulberry, where the shelter of the Alps gives the high spring temperatures that are needed by the silkworm. Italy ranks after Japan and China in production of **raw silk**. Summer heat is sufficient for the cultivation of **rice**, to which the streams that issue from the Alpine glaciers contribute water for irrigation. Here **maize** is raised, because the continental type of climate gives summer rain. Flax and hemp are also grown.

MINERALS AND INDUSTRIES IN ITALY

The most important mineral product is sulphur, which is obtained from the volcanic districts, particularly in Sicily, and is used for spraying the vines. Lead and zinc are mined in south-western Sardinia, and iron in the island of Elba. Italy has no great mineral resources, and she possesses little coal. On the other hand, she has abundant **cheap labour**, because her people live simply, and her population increases by 400,000 every year. She has also developed **electric power** from her **Alpine rivers** to such an extent that a network of reservoirs, pipes, power-stations, and transmission cables has turned the mountain districts of Piedmont, Lombardy, and

Venetia into one vast laboratory for the production of energy, light, and heat. As a result, the bulk of Italian **industry** is concentrated in the **northern plain**, and there 40 per cent. of her people lives.

Textile manufactures predominate, because their high value makes relatively unimportant the cost of importing raw cotton, wool, and silk. The cotton industry is the largest ; and the region between Milan and Lago Maggiore bears a striking resemblance to Lancashire, with the difference that electric power, as compared with steam, permits a wider distribution of factories. Italy is one of the largest producers in Europe of artificial silk, using imported wood-pulp as raw material. Sugar and cheese manufactures are important. The making of motor-cars is the chief trade of Turin (Fiat cars) ; heavy engineering and shipbuilding are carried on in the coastal plain of Liguria.

THE CITIES AND TRADE OF ITALY

Italy has ten cities with a population over 250,000. Four are in the northern plain ; four lie west of the Apennines ; one is in Sicily ; and one in the peninsula of Istria at the head of the Adriatic Sea.

With the exceptions of Turin and Piacenza, the largest cities of the northern plain are not situated on the Po, because in general this river has marshy banks. Most of them stand some distance back from the river as " Funnel Towns," where Alpine or Apennine river valleys open out on the plain. Alpine " Funnel Towns " are **Turin** (596,000 pop.), **Milan** (990,000), and **Verona** (153,000) ; Apennine " Funnel Towns " are Alessandria, Parma, Modena, and **Bologna** (245,000).

The seaport of the northern plain is **Venice** (256,000). Venice became a great commercial city in the Middle Ages, because the trade in Eastern commodities came right up the Adriatic, and then from Venice crossed the easy Brenner Pass to Central Europe. Venice lost control of this Eastern trade when the Portuguese discovered the Cape route to India. To-day **Trieste** (249,000) and **Fiume**, on either

side of the Istrian peninsula, are her rivals as seaports, both being more natural outlets for the produce of the Danubian lands.

The coastal plain of Liguria lies between the western end of the Apennines and the Mediterranean. This narrow plain, which extends into France, is known, from the Italian word for "coast," as the Riviera. **Genoa** (607,000) stands at its northmost curve. Behind the city the Apennines are broken by the Bochetta Pass, so that heavy railway traffic from the northern plain concentrates on the town, and it has become a great modern seaport. In the past it rivalled Venice as a port of the Eastern trade. Most towns on the Riviera, however, are engaged as health resorts in marketing the advantages of their winter climate. The Apennines are a barrier against cold winds from the north, and stand so near the coast that their bare cliffs reflect on to it the heat of the sun, giving a warmer winter than can be met with again till one reaches Naples, 250 miles farther south.

East of Genoa the easiest passes from the Po valley through the Apennines converge upon **Florence** (316,000), from which an open road leads southwards to Rome. Florence is situated in the centre of a fertile plain, close to the mountains from which it has drawn marble for its sculptures and buildings. It stands at a crossing of the Arno, and by the Arno valley has access to the sea at Pisa and Leghorn (Livorno). These factors helped to make it the foremost city of Italy during the Renaissance.

But the natural capital of Italy lies midway down the western coast at **Rome** (1,000,000), whence the Tiber valley leads to passes in the Apennines, and so to the east coast and the northern plain. Its site, on a group of volcanic hills 12 miles from the Mediterranean, in early times gave protection from malaria and pirates. As the Tiber is marshy at its mouth, the city became a seaport, while islands in the river made it easy to bridge. A part of Rome constitutes the territory of the **Vatican State**, ruled by the Pope.

Naples (841,000), situated on the Gulf of Naples in close touch with the densely settled Campania, is the largest seaport of Italy after Genoa. Naples and, to an even greater degree, **Palermo** (389,000), on the north coast of Sicily, are placed close to the cross-roads of the Mediterranean, where routes between the western and eastern basins cross those from the Atlas lands to Italy and France.

The chief exports of Italy are silk and artificial silk, cotton goods, vegetables and fruit. The chief imports are cereals and other food-stuffs, raw cotton and wool, and minerals, including coal and petroleum. The United States, Germany, Great Britain, France, and Argentina are Italy's best customers, and also supply more than half her imports.

Malta. South of Sicily, Malta, with a fine harbour at Valetta, is an important British naval base. It commands the Strait of Tunis between Sicily and Africa, and is about 1000 miles distant both from Gibraltar and the Suez Canal. Malta supplies northern Europe with early vegetables and fruit, and is finely situated for entrepôt trade—that is, for receiving commodities in bulk and distributing them to different centres.

(b) THE IBERIAN PENINSULA

The Pyrenees shut off the Iberian Peninsula from Europe so much more effectively than the Alps shut off Italy that until 1928 they were not crossed by a railway. Railway communication between Spain and France took place only round the western and eastern ends of the range. Two-thirds of the peninsula is composed of the Hercynian plateau called the **Meseta**, which is bounded on the north by the folded Cantabrian mountains and on the south by its own edge upraised as the Sierra Morena. It is crossed by the Central Sierras. In the south-east, the Sierra Nevada belongs to the Alpine folded mountain system.

The north of the Peninsula has a Maritime (or Oceanic) climate, with mild winters and cool summers similar to those of western England. Between the Central Sierras,

whose height brings them Maritime conditions, and the Cantabrian mountains the climate is transitional between the Maritime and Mediterranean types. There is a lack of rain, a hot summer, when the rivers dry up to mere "wadis," and a long, cold winter; and both northern beech and southern cistus shrub appear in the vegetation.

Portugal, southern Spain, the Ebro basin, and the Mediterranean coast have a climate of Mediterranean type, as is shown by the fact that only in these areas can the olive be cultivated (Fig. 64).

The coast-line of the Meseta on the Atlantic Ocean

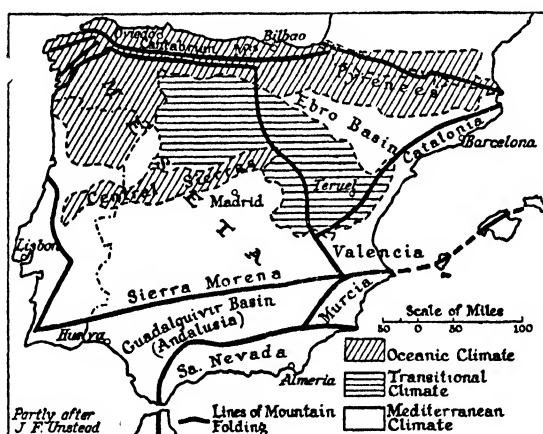


FIG. 66.—The Iberian Peninsula : Structure and Climate.

offers little shelter for vessels. The best harbours in the peninsula occur where the ridges of the folded mountains, which border the Meseta, run out into the sea. Such are Vigo, Corunna, and Ferrol at the western end of the Cantabrian mountains, and Cadiz, Gibraltar, and Cartagena at the two ends of the Sierra Nevada.

As the Meseta slopes south-westward, its rivers (Douro, Tagus, Guadiana, Guadalquivir) drain to the Atlantic. The **Ebro**, flowing to the Mediterranean between the Meseta edge and the Pyrenees, has so deepened its valley as to make access to the plateau from the east coast very difficult. Thus the plateau is to a large extent shut off

from the rest of Europe; and its people—the proud Spaniards of Castile—came to think themselves superior to those of all other lands.

Mohammedan Arabs, called Moors by the Spaniards, after overrunning northern Africa (p. 150), in 711 crossed the Strait of Gibraltar, which is only 12 miles wide, and conquered the "Mediterranean" districts of the Iberian Peninsula. They introduced cultivation of the orange, the mulberry, cotton, and sugar cane, and the use of mules and merino sheep. They drained the Guadalquivir marshes below Seville, and in Andalusia and the Mediterranean coastlands created garden areas of cultivation by irrigation. The Spaniards, and Portuguese, after 800 years of warfare, drove out the Moors (1492), and divided the peninsula into two states. Their position on the Trade-Wind route to America and close to Africa gave both Spain and Portugal an advantage over other European countries in the search for new trade routes to eastern Asia; but only the African territories of the huge empires they acquired remain in their possession to-day.

Spain has an area of 196,000 square miles and a population of 22,940,000, giving 117 inhabitants per square mile. Portugal has an area of 34,000 square miles and 6,190,000 inhabitants—that is, 182 per square mile. Both are much less densely peopled than Italy, which has 345 inhabitants per square mile.

AGRICULTURE IN THE IBERIAN PENINSULA

There is a contrast between the agricultural products of the coastlands and those of the interior. The surface of the **interior** is level over wide areas; temperature is too low in winter to allow the cultivation of citrus fruits; and, except in the Ebro basin, there is little water for irrigation. Agriculture therefore tends to take the form either of **sheep-farming**, with the practice of "transhumance," or of **cereal** production. Wheat and barley are the chief crops; but the cool climate of the plateau allows the cultivation also of oats and rye.

The **coastlands** yield a much greater variety of crops. There is a contrast between the mild, damp **west and north-west** coastlands, which receive sufficient **rainfall** for agriculture (Fig. 63), and the hot, dry **south and south-east** coastlands, where **irrigation** is necessary. Both in Spain and in Portugal the **olive** and the **vine** are important. Vineyards cover a larger acreage than in France, though they yield only half as much wine. The most productive vineyards are round Alicante, in Murcia; round Malaga and Jerez, on either side of the western end of the Sierra Nevada; and in the Douro valley of Portugal. Jerez has given its name to sherry, and Oporto, at the mouth of the Douro, to port wine.

The north and north-west of the peninsula have timber (pine, oak, beech, and chestnut), **apple** orchards, wheat fields, and **cattle** pastures. The southern and eastern coastlands, especially where irrigation is employed (as in Murcia and Valencia (Fig. 66), yield **fruits and nuts**—oranges, lemons, almonds, hazel nuts, melons, pomegranates, figs, the prickly pear, and the mulberry, in addition to olives and grapes. The **cork oak** grows in Andalusia, Catalonia, and southern Portugal. A heavier rainfall in Portugal than in Spain makes maize a more important cereal than wheat. The tropical date-palm is found along the south and east coasts and in the valley of the Guadalquivir, and **esparto grass**—a typical product of dry grassland—is grown for local use (making of sandals, matting, etc.) and for export.

Important sardine and tunny **fisheries** give employment on the coasts of Portugal and north-western Spain, Vigo and Corunna being centres of the industry.

MINERALS OF THE IBERIAN PENINSULA

The minerals of the Iberian Peninsula are found chiefly along the edges of the Hercynian Plateau of the Meseta (p. 247). The best **coal-field** in Spain lies on its northern edge near Oviedo, and 60 per cent. of Spanish **iron** ore is mined round Leon and Bilbao. The importance of Spanish

iron is European rather than national, nearly all the ore being exported. Since most of the mines are 1500 feet above the sea, there is only a short gravity haul to the seaboard ; and the northern Spanish ports are conveniently situated for shipping the ore to its chief markets in Britain and Germany. Iron also occurs on the east and southern edges of the Meseta, production being most important at Teruel and Almería. Other minerals are coal and lead in the Sierra Morena ; **copper** in Andalusia (Rio Tinto, Tharsis) ; quicksilver at Almaden, near Ciudad Real ; and **tin** in Galicia.

CITIES AND TRADE OF SPAIN

The capital of Spain and the centre of the railway system is **Madrid** (834,000), which, by its position in the centre of the country, helps to hold together the provinces of the plateau and the coastlands. The chief seaport and the greatest industrial city, **Barcelona** (782,000), on the coast of Catalonia, the most progressive province of Spain, has local water-power, and is able to import coal and raw materials by sea for its manufacture of woollen, cotton, and silk textiles, and of iron and leather goods. **Valencia** (274,000), standing midway on the Mediterranean coast, manufactures silk, and exports the iron ore of Teruel. The tidal port of **Seville** (219,000), 75 miles up the Guadalquivir (the only Spanish river of value for navigation), is, like Valencia, a typically Moorish city with white, flat-roofed houses, and is the home of bull-fighting. It has manufactures of porcelain and cigars. Spain has a number of smaller towns of historical importance from their command of plateau and mountain routes. Such are Saragossa in the Ebro basin, and Burgos, controlling the Pancorbo Pass.

The chief exports are southern fruits (especially oranges and grapes), timber, and minerals, France, Great Britain, and the United States being Spain's best customers.

The **Balearic Islands**, off the eastern coast of Spain, contain the harbour of **Port Mahon** in Minorca, which

was held as a British naval base during most of the eighteenth century.

CITIES AND TRADE OF PORTUGAL

Portugal, separated from Spain by a frontier-belt of sparse population along river gorges and mountain crests, looks west to the Atlantic rather than east to the Meseta, and has thus maintained its existence as an independent state. **Lisbon** (587,000), the capital, has a good harbour on the Tagus estuary ; **Oporto** (215,000), the wine port on the Douro, with textile manufactures, is the industrial centre of Portugal, as Barcelona is of Spain. Wine is the chief export, followed by fish and cork.

GIBRALTAR

At the western entrance to the Mediterranean, Gibraltar has been a British fortress since 1704, and during the naval wars of the eighteenth and nineteenth centuries was a key-position in the control of the Mediterranean. Under modern conditions of warfare its importance has considerably diminished.

(c) THE BALKAN PENINSULA

The Balkan Peninsula has no marked physical boundary that separates it from the rest of Europe ; its northern limit may be taken as the east-west line formed by the Sava and the Danube below Belgrade. Its core is the Hercynian plateau of the **Rhodope Upland**. This has roughly the shape of an inverted letter T. It is, however, filled in to a triangular form by transitional areas on either side, which have escaped folding by earth pressure, but differ from the barren Upland in containing basins of fertile soil.

On the north-east of this triangle are the folded Balkan mountains. On the west the folded Dinaric Alps closely follow the coast-line of the Adriatic as far as the Drin Gulf, south of which they are continued as the Albanian and the Pindus mountains into the Morea Peninsula. The

Dinaric Alps are largely composed of limestone, which (instead of forming soil) is dissolved so completely by streams and rain as to make a bare "karst" landscape of naked rocks. This wall of barren rocks cuts off the fertile basins in the interior from the Adriatic coastal plain, where sinking of the coast has let the sea into L-shaped gulfs, which give many excellent harbours.

Most of the traffic of the peninsula, therefore, unable to reach the Adriatic, is forced to use as routes the fertile transitional basins on the flanks of the Rhodope Upland, in

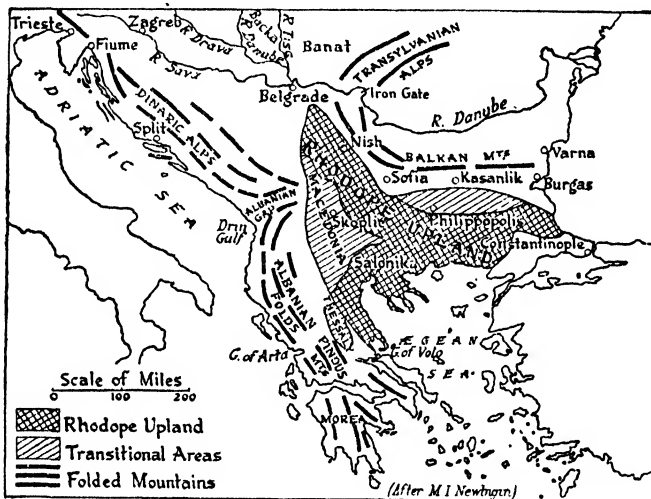


FIG. 67.—Structure of the Balkan Peninsula.

order to find a sea outlet on the Mediterranean. Such routes run either south-eastward from Nish (Niš) and Sofia through the Philippopolis basin to Constantinople, or southward from Belgrade through the Macedonian basin to Salonika (Fig. 67). As these routes were naturally used by invading armies, as well as for the transport of goods, the development of these most fertile lands of the peninsula was long delayed. The fertile basins are further separated from each other by the barren Rhodope Upland, so that there is no natural centre around which one large national state could develop. Thus the Balkan

Peninsula has been torn by rivalries between a number of small states, each anxious to secure an outlet on the Mediterranean.

Bulgaria owns the Philippopolis basin, but has ports only on the Black Sea (Varna, Burgas). **Yugoslavia** has the greater part of the Macedonian basin, as well as the Backa and Banat districts in the Plain of Hungary. But Salonika on the *Ægean*, the natural seaport of the Macedonian basin, belongs to Greece; Fiume, the natural outlet on the northern Adriatic of the Hungarian Plain, is Italian: while Yugoslavia's access by the Albanian Gap to the southern Adriatic at the Drin Gulf is blocked by **Albania**. Only **Greece**, amongst the Balkan states, has all the seaports she requires.

The Dinaric Alps and the Albanian mountains prevent "Mediterranean" climatic conditions from reaching the main mass of the peninsula, and confine these conditions to the Adriatic coast, to peninsular Greece south of a line drawn between the gulfs of Arta and Volos, and to the northern shore of the *Ægean*. Outside these limits, climate is continental in type, with cold winters, relatively hot summers, and rain at all seasons, decreasing in amount from west to east.

STATISTICS OF THE BALKAN PENINSULA.

Country.	Area (sq. miles).	Population.	Capital.	Exports.
Greece .	50,000	6,204,000	Athens	Garden products, oils.
Albania .	10,000	1,003,000	Tirana	Animal food, fish.
Bulgaria .	40,000	5,478,000	Sofia	Tobacco, eggs.
Yugoslavia .	96,000	6,894,000	Belgrade	Timber, maize, eggs, wheat.
Turkey in Europe	9,000	1,004,000	Ankara	—

AGRICULTURE AND MINERALS IN THE BALKAN PENINSULA

In both **Yugoslavia** and **Bulgaria** agriculture takes the form of the production of cereals by peasants on small holdings and in general still by primitive methods. **Maize** predominates in the west, **wheat** in the drier east. Yugoslavia, with a greater acreage under maize, can feed more pigs than Bulgaria, and has also many cattle. Bulgaria, which contains a greater proportion of mountainous land, has the larger number of sheep. Yugoslavia fells timber, and grows plums for export and prunes. Bulgaria raises tobacco, and manufactures the scent called attar of roses in the Kasanlik district (Fig. 67), which is sheltered from the cold north winds of winter by the Balkan range.

In contrast with the peasant farmer of these grain-producing countries, the **Greek** is typically a gardener or a sailor, because his coastlands yield luxuries rather than bread cereals, which he must purchase by means of trade. The "transitional" inland basin, with a surface and a climate suited to the growing of grain on a large scale, occurs only in Thessaly. **Garden products** (currants, dried figs, oranges, pears, and other fruits), **oils**, and **wine** make up 87 per cent. of the exports; and Greece owns a tonnage of **shipping** that is three times as large in proportion to her population as that possessed by France or Italy. Fine **tobacco** ("Turkish") is grown in southern Macedonia and western Thrace, and is exported from Kavalla.

None of these countries has a large **mineral** production. Coal is mined in all three; iron in Yugoslavia and Greece; lead in Yugoslavia; and copper in Bulgaria.

CITIES OF THE BALKAN PENINSULA

Istanbul (**Constantinople** — 690,000 pop.), situated on the Bosphorus, and Eastern Thrace, east of the Maritsa River, are all that remains of the once great Turkish

Empire in Europe, of which Constantinople was the capital. Turkey still controls the waterway of the Bosphorus—Sea of Marmara—Dardanelles between the Black and the Mediterranean Seas.

Athens and its port of **Piræus** contain 700,000 inhabitants; and Piræus receives two-thirds of all the imports of Greece. In the district of Attica, in which Athens stands, the soil is poor, and the climate dry; so that the city, which grew up round its citadel on the rock of the Acropolis, in ancient times made use for overseas enterprise of its two harbours at Piræus and Phaleron, and its situation farther eastward than that of any other Greek state. Its seamen traded with the cornlands of Anatolia, Thrace, and southern Russia, and controlled the tunny fisheries of the Ægean Sea.

Salonika (236,000), the only other large city in Greece, lies at the southern end of the corridor through the Macedonian mountains formed by the valleys of the Morava and the Vardar. It is placed east of the Vardar delta, to avoid silting up of its harbour, and contains cotton mills, tobacco factories, leather works, breweries, and flour mills.

At the northern end of the Morava-Vardar corridor **Belgrade** (241,000) stands at the junction of the Sava with the Danube, and is thus a centre of railway and river traffic, where important routes from north to south are crossed by others from west to east. **Zagreb** (185,000) is farther up the Sava, between oak and beech forests on the slopes of the Dinaric Alps and plum orchards and maize fields on the Hungarian Plain. Zagreb has railway connection with Yugoslavia's Adriatic ports—Barosh (beside Fiume), Split (Spalato), and Sibenik (Sebenico).

Sofia lies on the route of the Orient Express from Vienna by Belgrade to Istanbul. As it has access to the Bulgarian coal-field at Pernik, it possesses small industries of tanning, weaving, and tobacco manufacture, which make use of raw materials locally produced.

EXERCISES II

A

1. On a blank map of Italy insert these names :
 - (a) Lakes Como, Garda ; The Appenines, Etna, Stromboli ; Corsica.
 - (b) Trace the courses of the rivers—Po, Arno, Tiber.
 - (c) Mark with a dot—Rome, Naples, Venice, Genoa, Milan, Turin, Florence, Palermo.
 - (d) Trace the railway from Turin *via* Bologna and the east coast to Brindisi.
2. On a map of Spain and Portugal insert :
 - (a) Sierra Nevada, Meseta, Balearic Islands, Cape Trafalgar.
 - (b) Trace the rivers—Guadalquivir, Ebro, Tagus ; and the boundary between Spain and Portugal.
 - (c) Madrid, Barcelona, Seville, Valencia, Granada, Corunna, Oporto, Lisbon.
3. On a map of the Balkan Peninsula insert :
 - (a) River Danube-Drava-Sava ; Dinaric Alps ; Greece, Albania, Yugoslavia, Bulgaria, and their respective capital towns.
 - (b) Write the name over an area of supply—pigs, sheep, oil, currants, tobacco.
4. (a) Why should the west coast of Italy be more important than the east ?
(b) Why is Genoa greater for commerce and Venice as a tourist centre ?
5. Give the name of a town or district of Italy associated with the following : motor-car manufacture, silk, rice, sulphur, iron, cheese, straw-plait, oranges, wine, olive oil.
6. From which districts in the Iberian Peninsula do we obtain : dates, cork, oranges, iron, copper, quicksilver, port wine, sardines ?
7. Why are the rivers of the Iberian Peninsula of so little use for navigation, and their valleys for railway construction ?

B

1. " Europe ends at the Pyrenees." Say in what ways you think this statement about Spain is true. In what respect is it untrue ?
2. Italy possesses little coal. How does she overcome this difficulty ? What industries does she engage in ?
3. Why are the states of the Balkan Peninsula often in disagreement with one another ? Which one (or two) has decided advantages over the others ? What are these advantages ?
4. Contrast the Alps as a natural barrier with (a) the Himalayas, (b) the Pyrenees.

5. Is it accurate to classify Spain, Italy, and the Balkans as regions of Mediterranean Climate ?
6. Write short notes on the position and importance of these towns : Venice, Milan, Naples, Seville, Barcelona, Istanbul, Athens.

WESTERN EUROPE

The lands on the western seaboard of Europe, which have Maritime climate, are the British Isles, France, Belgium, the Netherlands, Denmark, Norway, and Iceland. These countries contain 113,500,000 inhabitants. The land relief is so varied that they have developed for several centuries as national states ; while in most cases manufacturing industries have become important, based on their possession of coal-fields and iron ore. Industrial expansion has led to a grouping of the populations of these countries in a relatively small number of large towns. In the immediate neighbourhood of these centres agriculture has largely taken the forms of dairy-farming and market-gardening, while elsewhere such highly priced crops as sugar beet are raised, because a good profit is necessary to repay expenditure on equipment and high wages.

(a) FRANCE

France stands at the western end of all the land-routes across Europe ; her shores are washed by the Atlantic, the Mediterranean, the English Channel, and the North Sea. The Ardennes, the Jura, the Alps, and the Pyrenees give her good natural land frontiers. As less than half the country is over 650 feet above sea-level, canals have been constructed in order to make possible cheap water transport. The proportion of waterways to railways is about one mile to four.

Favourable climatic conditions and large areas of fertile soil make France one of the most important wheat- and wine-producing countries of Europe, while rich supplies of coal and iron ore give her a leading position amongst the industrial countries. Her area of 212,000 square miles contains a population of 41,834,000.

DISTRICTS AND PRODUCTS OF FRANCE

France contains two Hercynian uplands (the Central Plateau and the Armorican Region), three lowlands grouped round the Central Plateau (the Basins of Provence, Aquitaine, and Paris), and a fourth lowland (Alsace) between the Vosges and the Rhine.

(1) The thin soil of the **Armorican Region** is largely covered by moors and woods, and raises only rye, oats, and buckwheat (a food plant suited to very poor soil).

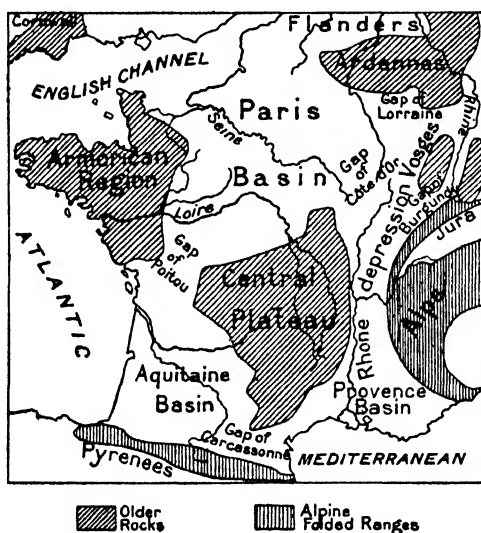


FIG. 68.—The Districts of France.

On the coast, where there is shelter from wind, the mild winter allows the cultivation of peaches, apricots, and early vegetables. The natural poverty of this district of **Brittany** and the broken coast-line have led the Bretons to become **seamen and fishermen**, working as far from home as the Banks of Newfoundland. **Lorient** is a great fishing port, **Brest** a naval harbour, and **Nantes** (187,000) a port on the Loire with shipbuilding industries.

(2) The **Central Plateau** slopes westwards from its eastern edge, the Cévennes, but reaches its loftiest summits in a volcanic area in the north (Mt. Dore, 6188 feet), that

receives the heaviest rainfall in France. The moister western part of the plateau pastures cattle; the drier eastern part pastures sheep. In the north the upper valleys of the Loire and the Allier contain fertile agricultural land.

(3) The **Basin of Provence** occupies a gap between the mountain folds of the Alps and the Pyrenees, and is the one district of France which has **Mediterranean climate**. It grows the olive (as far north as Valence), the vine, the sweet chestnut, and the mulberry. The Rhône depression (between the Central Plateau and the Alps and Jura) leads southwards to it from the **Gap of Côte d'Or**, the southern slopes of which produce the famous **Burgundy wines**. Through this depression flows the Saône-Rhône, the main river rising in Switzerland in Mont St. Gotthard, and cutting through the Jura to Lyons, where it is joined by the Saône.

In this area much use is made of electricity, generated from **water-power**. Using the local supply of raw silk, **Lyons** (579,000 pop.) has become the headquarters of the French **silk industry**, with **St. Étienne** (191,000) as a secondary centre. Local iron and coal have led to the manufacture of **iron and steel** at **Le Creusot** and Alès (Alais). In the south there is **oil-refining** at Marseilles and Montpellier, and also a manufacture of **soap** from olive-oil. Flower-gardening and the making of perfumes are connected with this soap manufacture. The whole trade of this hinterland (except the export of wine, which is shipped from Sète) is handled by the great commercial city of **Marseilles** (800,000), situated east of the Rhône delta. Still farther east lies the naval fortress of **Toulon** (133,000), beyond which stretches the French Riviera, with its mild winter climate and fashionable tourist resorts (**Nice**, Monte Carlo).

(4) The **Carcassonne Gap** between the Central Plateau and the Pyrenees leads from Provence to the **Basin of Aquitaine**. Here both the northern beech and the southern evergreen oak appear. Pine forests have been

extensively planted on the sandy coast south of the estuary of the Garonne (called the Landes), both for timber and turpentine, and to prevent half-desert conditions from spreading inland. Maize is grown in an area of heavy rainfall immediately north of the Pyrenees (Fig. 63); wheat and tobacco are the crops of the upper Garonne valley round **Toulouse** (194,000), at the western end of the Carcassonne Gap. The "Gironde" district, or basin of the Garonne, is famous for its **claret wines**, while Cognac, in the Charente basin farther north, has given its name to **brandy**. The only large seaport on this dune-

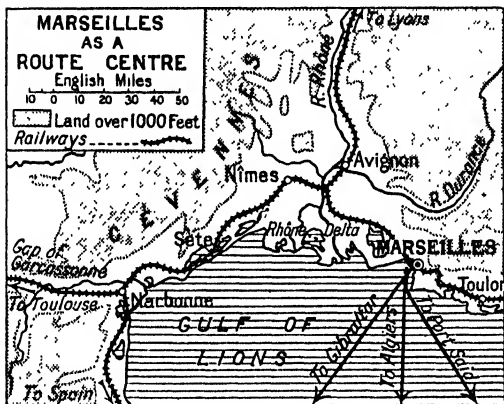


FIG. 69.—Marseilles as a Route Centre.

fringed coast is **Bordeaux** (262,000), situated on the Garonne estuary 60 miles from the sea.

(5) The **Gap of Poitou** between the Central Plateau and the Armorican Region leads from Aquitaine to the **Paris Basin**, which covers in area one-quarter of all France. Because of its size and the variety of its products, and also because of the Gaps by which it is linked to the other two Basins, to Flanders, and to Alsace, the Paris Basin is the heart of France, the centre of her road and railway systems and of her national life.

The centre of this Basin is **Paris** (2,891,000 pop.), situated on the middle course of the Seine where the river is joined by its tributary, the Marne, and just above its

junction with the Oise. Like New York (p. 122), it has spread far beyond the limits of the island in the Seine on which it was founded ; and its predominance has prevented any other town of the Basin becoming important within a radius of 70 to 80 miles, at which distance it is surrounded by several cities of moderate size. Such are **Havre** (165,000) and **Rouen** (122,000), river-ports on the Seine, the latter also manufacturing cotton ; **Amiens**, which obtains power for its cotton mills from the Lille coal-field ; **Reims** (112,000), the centre of the wine district of Champagne, which manufactures the wool of sheep grazed on the chalk uplands that lie round the margin of the Paris Basin ; **Troyes**, which specialises in hosiery ; and **Orleans**, where traffic through the Poitou Gap leaves the northern bend of the Loire to strike for Paris.

Several districts which have marked characteristics of their own lie within the Paris Basin.

(a) The water-parting between streams which drain to the Seine and those which drain to the English Channel divides the wine-lands to southward from the cider-lands to the north, where autumn temperatures are too low to ripen the grapes of the vine. To these **cider-lands** the projecting Cotentin peninsula tempted dragon-ships from Scandinavia, to make there a new **Normandy**, or Norseman's land. Moister soils in the east result in cattle pastures, and so lead to the making of **butter** and Camembert **cheese** ; from the drier west comes a famous breed of horses. The second largest **iron** deposits in France are south of Caen, the ore being partly exported to Great Britain and the Netherlands. In addition to Havre and Rouen, Paris has an out-port at **Cherbourg** in the Cotentin peninsula, and a packet-station at **Dieppe**.

(b) The Loire and several of its tributaries, which rise in the Central Plateau, water **Touraine**, " the garden of France," where maritime influences penetrate through the Poitou Gap to the south-west of the Paris Basin, and soften its climate. **Vines** and **fruit** trees are cultivated in the shelter of its chalk escarpments, while along the

valley slopes historic castles rise above the white houses of the towns.

(c) The coal-field which lies along the north-western edge of the Ardennes extends from Belgium into **French Flanders** and **Artois**, and supplies power for **manufacturing industries**. **Dunkirk**, third port of France after Marseilles and Havre, imports wool, linseed, and cotton for the factories of **Lille** (201,000), **Rubaix** (117,000), Turcoing, and Arras. Sugar beet is grown for the making of sugar and alcohol. **Calais** and **Boulogne** are packet-stations, which provide the shortest channel crossing.

(6) North of the highland of the Vosges and south of the Ardennes the **Gap of Lorraine** leads from the Paris Basin to **Alsace** in the Rift Valley of the Rhine (Fig. 68). The wealth of Alsace consists of wheat lands round **Strasbourg** (181,000) on the Rhine and Mulhouse, extensive deposits of potash (Fig. 74), and the cotton industry of Mulhouse, which uses coal imported from the Rhine coal-fields. Lorraine mines salt near **Nancy** (120,000), on the Moselle, where it is utilised by chemical industries, and **coal** throughout an area which extends from the Saar coal-field to south of **Metz** (also on the Moselle). It has rich deposits of **iron** ore (Fig. 73). France has the largest production of pig iron and steel in the world after the United States.

Food products compose 22 per cent. of French imports, raw materials compose 56 per cent., and manufactured goods 22 per cent. In exports food products account for 14 per cent., raw materials for 23 per cent., and manufactured goods for 63 per cent. This predominance of manufactured goods in the export trade and of food products and raw materials in the import trade is characteristic of industrialised countries.

(b) BELGIUM AND THE NETHERLANDS (HOLLAND)

Notice in Fig. 68 how the Flanders Gap leads from the Paris Basin between the Ardennes and the North Sea coast to the plain of Northern Germany. Two important rivers, the Schelde and the Sambre-Meuse (Maas), rise in

the Paris Basin, flow through this Gap roughly parallel with the coast, and then curve westwards to enter the sea through wide estuaries. The Maas estuary joins that of the much greater Rhine. In this Flanders Gap no natural barrier separates France from Germany; and the fact that the Gap belongs to neither country, but is shared by the two "buffer" states of Belgium and the Netherlands, is due to historical rather than to geographical reasons. Many battles have been fought on Belgian soil.

The Netherlands has an area of 12,600 square miles, and contains 7,920,000 inhabitants, or 625 per square mile. Belgium has an area of 11,750 square miles and 8,092,000 inhabitants, or 688 per square mile. Both countries, therefore, are very densely populated.

(i) **Belgium** consists in the south of part of the Ardennes highland, in the centre of the Sambre-Maas valley, which cuts for 100 miles through the Aachen-Belgian coal-field (Fig. 73), and in the north of a plain, which is mainly the basin of the Schelde. Both banks of the Schelde estuary belong to the Netherlands. Along the coast a strong, eastward-setting current has built sand-dunes between Calais in France and Texel in the Netherlands. The Belgian coast has thus become popular as a bathing resort (**Ostend**).

Three-fifths of the whole country is under cultivation, the chief crops being oats on the Ardennes highland, which has a relatively high rainfall, rye and fruit on the sandy soil of the district of Brabant round Brussels, and wheat on the heavier clay soil of the plain immediately north of the Maas. Belgian Flanders (Lys basin) has an important dairying industry, and grows the world's finest flax, as well as tobacco, sugar beet, hops, and garden flowers.

It is, however, the industrial development of Belgium which enables the country to support so dense a population. The modern **industrial belt** is that which contains the three coal-mining areas of **Liège** (168,000 pop.), Charleroi, and Mons. (There is also coal in the Campine district on the Netherlands border.) In this belt zinc, lead, and

copper are mined ; and it formerly produced iron ore. On these resources mineral industries developed. Belgium has the sixth largest output of pig **iron and steel** in the world, although iron ore has now to be imported from Lorraine. Other industries of the belt are manufactures of glass and hardware, coal-tar distillation, brewing, distilling, and sugar refining.

The **textile industries** of Belgium are chiefly situated in Flanders, which since the Middle Ages has been famous for its making of cloth. **Ghent** (Gand—169,000), at the junction of the Lys with the Schelde, is a centre of the manufacture of cotton, as Roulers and Courtrai are of linen, and Bruges is of lace. In Brabant **Brussels** (839,000), the capital, and Malines (Mechlin) also manufacture lace. Verviers, on the edge of the Ardennes sheep pastures, has a woollen industry. The **commercial seaport** of the whole country is **Antwerp** (Anvers—294,000), which is situated 50 miles up the navigable estuary of the Schelde, and thus has a harbour that is sheltered from storms, while it is as near Dover Strait as London, and nearer than London to the network of railways and canals which carry the commodities of western and central Europe to the Atlantic and the North Sea.

The small state of **Luxembourg** south of Belgium has an output of pig iron and steel, which comes next after that of Belgium in world production.

(ii) **The Netherlands** consists mainly of the delta of the Rhine. Its whole area is less than 300 feet in altitude ; and 40 per cent. has been reclaimed from the sea by the building of dykes and systematic drainage. From the “polders”—that is, land below sea-level—surplus water is drawn off by electrical, motor, or steam pumps, and discharged into canals and reservoirs. The Zuider Zee has been shut off from the North Sea by a great embankment, and is in process of becoming the freshwater IJssel Lake, while “polders” from which the water has been drained will add 10 per cent. to the land under crops. By unflinching energy and courage the Dutch

have overcome the natural disadvantages of their home on "the shifting edge of Europe."

Crops cover 25 per cent. of the Netherlands, gardens and orchards $3\frac{1}{2}$ per cent., and pasture 40 per cent. As in Belgium, the chief crops are rye (for making bread and gin), oats, wheat, potatoes, and sugar beet. Intensive market-gardening flourishes in the "polders"; there also the famous Holstein-Friesian cows are kept for dairying. On the sandy soils in the south, dairying is combined with arable farming. **Haarlem** (119,000 pop.) is the centre of bulb-growing, which takes place in the reclaimed bed of the Haarlem Sea. Shore fisheries yield catches of shrimps, oysters, and anchovies; and Dutch fishing-boats on the Dogger Bank in the North Sea are outnumbered only by British vessels.

About 20 per cent. of the working population is engaged in agriculture. About the same proportion is employed in commerce and transport, while coal is mined where the Belgian Campine coal-field extends into Limburg province. The flat relief of the country and its many rivers have made easy the construction of canals, so that the Netherlands contains nearly as many miles of waterways as of roads and railways combined.

The increasing population, however, cannot find full employment in these occupations, and in consequence an expansion of **manufacturing industry** is taking place, so that (as in Belgium) the export of manufactured articles is greater in value than the export of agricultural and mineral products combined. On the Limburg coal-field are chemical, cement, glass, and paper industries. The province of Overijsel on the German frontier is the chief centre of the textile industries; in North Brabant (between the Belgian frontier and the Maas) Tilburg manufactures woollens, Breda artificial silk, deLangstraat leather, and Eindhoven electrical appliances. North Holland (west of the Zuider Zee) is the centre of the timber and cotton industries.

In addition, the estuaries of the Rhine, Maas, and

Schelde are ocean gateways to Europe ; and the Netherlands possesses a great colonial empire. Colonial produce thus supplies raw materials for the manufacture of sugar, tobacco, chocolate, margarine, and rubber ; and overseas trade stimulates shipbuilding, so that Dutch yards launch a tonnage surpassed only by Great Britain. **Amsterdam** (766,000), which communicates by canal with IJmuiden on the North Sea and Gorinchem on the Rhine, receives and distributes the bulk of these colonial imports. **Rotterdam** (587,000), situated on a branch of the Rhine delta, and connected by canal to the Hook of Holland on the North Sea, is a transit port through which trade passes to and from the vast hinterland of the Rhine basin. Amsterdam is the capital ; but the seat of the government is **the Hague** (449,000), where also is the Permanent Court of International Justice.

(c) **DENMARK, ICELAND, AND NORWAY**

The Scandinavian highland is cut through from Trondheim to Oslo by a valley which divides its long, relatively narrow north-eastern area (called Kjolen—"The Keel"—from its resemblance to an upturned boat) from the bulkier mass of the Dovre-fjeld and Jotunheim ("Giants' Home") in the south-west. This valley is continued southward by the Kattegat Strait, from which the three narrower straits of the Little Belt, the Great Belt, and the Sound give access to the Baltic.

(i) The area of **Denmark** is 16,000 square miles, and its population 3,550,000. The country consists of the peninsula of Jutland and a group of islands in the Baltic. Denmark has long summers and fairly short winters, which favour the country's main industry of **dairying** by making indoor feeding of stock necessary for only a short period in the year. In proportion to population, Denmark has more dairy cattle than any other country in the world. Natural advantages are turned to full use by hygienic methods of production and a co-operative system of collecting, grading, and marketing dairy products and bacon.

Exports of bacon, butter, and eggs to Great Britain form 50 per cent. of the value of its export trade, although in their homes the Danes use margarine instead of butter. Oats and barley for fodder are the chief cereal crops, and as much land is devoted to the production of green fodder and pasture as to grain.

Copenhagen (617,000 pop.), the capital and seaport of Denmark on the island of Zealand, is situated on the Sound at the southern end of the Trondheim-Oslo-Kattegat depression. Train-ferries cross the Sound between Copenhagen and Malmö in Sweden.

(ii) Denmark's colony of **Greenland** is a vast plateau almost entirely covered with ice and snow. **Iceland** is not a colony of Denmark, but has the same king. About half its area of 39,000 sq. miles has some vegetation—mostly grass; the remainder of the island is covered with snow, lava, and sandy or stony desert. Iceland has 108,000 inhabitants, 40 per cent. of whom get their living from farming. There are 6 sheep to every inhabitant (the largest proportion in Europe), and salted mutton is exported. The cod and herring **fisheries** round its coasts, however, give most employment, and furnish about 88 per cent. of the island's exports.

(iii) **Norway** grew up as a state round the Trondheim-Oslo valley, **Oslo** (249,000) becoming its capital. Its area is 124,000 square miles, and its population 2,809,000. Like Iceland, Norway draws wealth from its **fisheries**. The Scandinavian peninsula is fringed by a "skerri-guard" of islands, which on the Norwegian coast between Stavanger and the North Cape provides an almost continuous series of channels for sheltered navigation. The Scandinavian highland has been tilted down towards the south-east, so that the plateau of the High Fells ("fjelds") rises directly from the heads of the long fiords that cut deeply into its western coast-line. Trondheim is the centre of a tourist industry on this coast.

Little fields of rye, oats, barley, and potatoes occupy the narrow strips of land that lie between the fiord walls

and the water's edge, and cattle are pastured in summer on the " fjelds " ; but this type of coast is a natural nursery of fishermen and seamen. The coastal fisheries are the most important—for cod from the Lofoten Islands northwards, for herring from Bergen northwards ; but Norwegian fishermen work as far from home as the coasts of Equatorial Africa and the South Atlantic. **Bergen** (98,000) and Alesund are the chief fishing centres ; Bergen and Oslo are commercial seaports, for Norway has a greater tonnage of shipping than any European country except Great Britain.

Norway's second main source of wealth lies in its **forests**, which occupy one quarter of its area. The Scandinavian highland was covered in the past by the Ice Sheet (p. 249), and even to-day contains glaciers which extend over hundreds of square miles. The Ice Sheet scoured the soil off the rocks, but in compensation formed lakes, the streams from which supply abundant water power to generate electricity for the manufacture of wood-pulp, paper, and cellulose, and for electro-chemical and electro-metallurgical industries.

As in the case of Denmark, Great Britain is Norway's best customer (closely followed by Germany), purchasing timber, fish, and paper, and in return selling to Norway coal, textiles, iron and steel goods, and machinery.

EXERCISES III

A

1. On a blank map of France insert :
 - (a) Alps, Jura, Cévennes, Vosges, Ardennes, Brittany, Normandy, Champagne, Burgundy, Provence, Alsace.
 - (b) Trace these rivers : Loire, Seine, Rhône-Saône, Garonne.
 - (c) The six principals towns of France in addition to four ports.
2. On a map of Denmark, the Netherlands, and Belgium insert : Skagerrak, Kattegat, the Sound, Jutland, Zealand, Copenhagen, Ardennes, Maas, Schelde, Rhine, Zuider Zee ; five towns in the Netherlands, and five towns in Belgium.
3. Which district of France has Mediterranean Climate, and what products does it yield ?

4. State for what industry each of the following towns is noted : Malines, Brussels, Bergen, Liège, Ghent, Nantes, Haarlem, Amsterdam, Verviers, Breda.
5. State the great advantages Belgium and the Netherlands enjoy for easy cheap transport.
6. Why are windmills, as a source of power, so successful in the Netherlands in comparison with steam-power ?
7. When the Dutch boast, " God made the sea ; we made the land," to what do they refer ? Explain " polder."
8. Name areas supplying : cognac, cider, silk, soap, turpentine, potash, bulbs, lace, glass, dairy-produce.
9. The sea is very important to Norway and the Norwegians. How many instances can you give to prove this fact ?
10. What type of forest predominates in Norway, and to what uses is the timber put ?

B

1. Name the principal highland and lowland areas in France, illustrating by a sketch map how the lowlands are connected to each other.
2. What advantages of position has Paris to make it the capital of France ?
3. Name as many cross-Channel routes as you know. Which route is the shortest ? Find out the cost of a journey by the different routes from London to Paris. Which is the cheapest route ?
4. Write short notes on the following, giving their exact positions : Toulon, Toulouse, Brest, Cherbourg, Lyons, Bordeaux, Lille, Nancy, Metz, Copenhagen.
5. Compare the occupations of the people in Denmark with those of the Netherlands and Belgium.
6. What particular sights and spectacles does each of the lands in this section offer to tourists ?

CENTRAL EUROPE

Central Europe contains a population of 142,000,000. Its most conspicuous physical features are the Baltic Sea with its Gulfs of Bothnia and Finland, the Hercynian plateaus, and the chains of the Alps and the Carpathians, with the great rivers which rise in these highland areas, and flow either northwards to the North Sea and the Baltic or eastwards to the Black Sea. In relief the Region is

sufficiently broken up into mountain and lowland to supply areas marked off by natural boundaries within which national states have developed.

Climatically it is transitional between the Maritime and Continental types as far as about 15° E., eastwards of which Continental climate prevails. In its southern portion the presence of the beech tree in the forests (Fig. 64) shows that climatic conditions are such as to allow the growth of a wide choice of crops; beyond the north-eastern limit of the beech cultivation is practically restricted to the hardier grains.

(a) THE ALPS AND SWITZERLAND

A line drawn roughly between the Lake of Constance and Lake Como (Fig. 65) divides the **Western** from the **Eastern Alps**, the Western Alps being loftier, more glaciated, but much less broad than the Eastern. With one exception—the furrow 130 miles long occupied by the Upper Rhône and Upper Rhine—valleys in the Western Alps follow the slope of the mountains from crest to plain; in the Eastern Alps many large valleys—Inn, Mur, Drava—are “longitudinal,” that is, they run roughly parallel to the general direction of the chain. Such longitudinal valleys tend to be more isolated than transverse valleys; and the inhabitants of the Eastern Alps are more truly mountain folk than those of the Swiss Plateau. The action of glaciers in paring away the central belt of the Western Alps has made possible the tunnelling of the Simplon, St. Gotthard, and Mont Cenis passes, and thus the construction of “through” railway routes between Northern Europe and Italy.

In the cooler seasons of the year, the temperature of northern Alpine valleys is often raised by **Föhn** (“favouring”) **winds**, which are sucked over the Alps from their southern slopes, cool and lose moisture in their ascent, become heated in their descent, and arrive warm and dry, thus melting the snow (p. 24).

Switzerland, which has an area of 16,000 square miles

and 4,066,000 inhabitants, lies between the crest-line of the Western Alps and that of the Jura, which branch north-eastwards from the Swiss Knot. Half its population lives on the Swiss Plateau, which was originally a basin between these two mountain chains, and has been filled up with waste soil. Its surface, however, is carved into hill and valley as the result of its being covered by glaciers in the Ice Age.

Mist is apt to cover the Plateau ; and thus a lack of sunshine hinders the production of crops. The large number of days in the year on which rain falls (an average of 148 at Berne) also tends to make stock-keeping more important than crop-raising. Only 5 per cent. of Switzerland consists of arable land, including orchards and vineyards, so that much food requires to be imported. On the other hand, 50 per cent. is grassland and 22 per cent. is forest. This 77 per cent. of productive area compares favourably with 30 per cent. in Norway. The grassland includes the high "alps," or shelves of weathered rock, which supply only summer grazing ; the valleys yield hay for winter use. By these means Switzerland feeds 2,500,000 **cattle**. Their milk is used in the manufacture of **cheese**, **chocolate**, and **condensed milk**.

Switzerland has no coal ; almost her only minerals are salt and asphalt. But the skill and diligence of her people make good her lack of such resources. Her streams have been harnessed to provide **hydro-electric power** ; and one-tenth of her population works in factories. The necessity of importing many raw materials, the small home market, and a long experience of delicate handiwork have led to Swiss industry employing much skilled labour upon relatively small amounts of material, as, for instance, in the production of **embroidered cotton** and **silk** goods (including artificial silk) rather than of woollens, and in the manufacture of **machinery**, **scientific instruments**, **clocks**, and **watches**.

Lines drawn from the junction of the Aar with the Rhine to Zug, and from Solothurn through Berne to Thun,

divide the Plateau into : (1) A densely populated **north-eastern** area, where textiles are manufactured. **Zurich** (249,000 pop.), at the north end of Lake Zurich, lies on the main railway route from Basle to Innsbruck and Vienna, which cuts across Switzerland instead of following the great north-eastern loop of the Rhine Valley. It has manufactures of silk, cotton, and machinery.

(2) A **central** area, where the “**tourist industry**” is of great importance, because the St. Gotthard and Gemmi-Simplon railways give access to the Alps *via* **Lucerne** and **Berne** (111,000), the capital of Switzerland. Switzerland’s prosperity depends largely on its “tourist industry,” more than 2,500,000 visiting the country every year.

(3) A **south-western** area, where the vine is abundant, and tobacco, sugar beet, and fruits are cultivated. **Geneva** (142,000), at the western end of the Lake of Geneva, is the seat of the League of Nations, and the south-western gateway of Switzerland. It has a watch-making industry.

Basle (148,000) lies at the crossing-place of the north-south route from the Rift Valley of the Rhine (Fig. 73) to the St. Gotthard Pass, and the east-west route from the Lake of Constance to France by the Gap of Burgundy, or Belfort (Figs. 65, 68). On it converges the transcontinental railway traffic to Switzerland and Italy from Calais, Ostend, and Rotterdam.

(b) THE GERMAN DANUBE AND AUSTRIA

The **Danube** rises in the Hercynian highland of the Black Forest, and is pushed north-eastwards by its Alpine tributaries against the Swabian and the Franconian Jura (which continue the Jura mountains into Germany) until it meets, and is turned south-eastwards along the edge of the Bohemian Plateau. At the Austrian Gate (Fig. 70) it cuts its valley between the Bohemian Plateau and the Alps ; at the Carpathian Gate it breaks through the eastmost spurs of the Alps at their junction with the Carpathians.

Immediately above the Carpathian Gate the Danube is joined on its left bank by the March, or Morava, which

flows through a corridor between the Bohemian Plateau and the Carpathians that leads by the Moravian Gate at its north-eastern end to the European Plain. About 70 miles south-west of the Carpathian Gate the Semmering Pass—the lowest of the great Alpine passes, and the first which was crossed by a railway—leads by Graz (152,000) in the upper valley of the Mur to Trieste on the Adriatic.

At this cross-ways of Europe between the Austrian and Carpathian Gates, Austria (the "Eastern Mark," or March) was founded to defend Germany against the Huns and Turks. From a German frontier state it became the centre of a great empire, ruling Germans, Slavs, Magyars, Italians, and Romanians. After the Great War the lands of this empire were divided between Italy, Yugoslavia, Romania, the new state of Czechoslovakia, Hungary, and Austria.

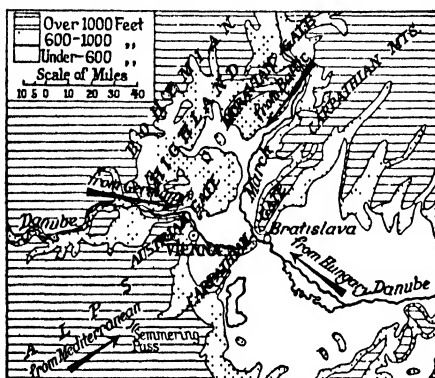


FIG. 70.—Position of Vienna.

Austria, with an area roughly equal to Ireland (32,000 square miles) and 6,732,000 inhabitants (chiefly Germans), is, like Switzerland, mainly an

Alpine state, without direct access to the sea. Her territory, however, in addition to most of the Eastern Alps, slopes downhill eastwards to include the Danube Valley between Passau and the Carpathian Gate. Thus 23 per cent. of the total area is under crops (chiefly rye, oats, wheat, potatoes, barley). Austria also grazes nearly as many cattle as Switzerland. Forests occupy 40 per cent. of the area, and supply raw materials for wood-working industries. Like Switzerland, Austria has largely developed hydro-electric power. She has also lignite coal, iron ore, and salt. Like Switzerland, she has to import food-stuffs. These are needed not so much to supply the needs of her "tourist industry" (for

the Eastern Alps are less accessible to visitors than the Western), as for her large capital, **Vienna** (1,824,000), which contains 27 per cent. of her population.

Austria is not placed so advantageously as Switzerland astride main routes across Europe. The traffic by the Brenner and Semmering Passes to and from Italy is not so great as that by the Simplon and St. Gotthard; and the Danube, in spite of its being under international control so that it serves all the countries through which it flows, has not the importance as a waterway which its length, volume, and course through the mountain barriers of Europe would seem to give. It is relatively shallow in autumn and winter; and navigation is endangered in winter by ice. Further, below its junction with the Iller at Ulm (Fig. 65), its current is very swift; and a boat takes three times as long to come up-stream as to go down. Above all, it flows eastwards to the Black Sea, where there are much poorer markets than it would have served had its course been westwards to the Atlantic.

(c) **LANDS OF THE LOWER DANUBE—(HUNGARY AND ROMANIA)**

The Carpathians run as a deeply curved bow from the Carpathian Gate and the Bakony Forest mountains to their connection with the Balkan range. On the inner side of the curve occur hot springs, at Budapest, and minerals. Against its outer side lie important oil-fields.

Within these enclosing mountains are two alluvial plains—the **Little Alföld**, between the Carpathian Gate and the Bakony Forest, and the Alföld, or **Hungarian Plain**. The Hungarian Plain and the Romanian Plain east of the Carpathians have both been covered with fertile loess. The Danube enters the Hungarian Plain at the Hungarian Gate north of the Bakony Forest, and immediately turns south, flowing parallel to the Tisa (Theiss). The waters of its great tributaries from the Eastern Alps, the Drava and the Sava, carry it eastwards through a second breach in the Carpathians to its swampy

delta on the Black Sea. The tremendous currents through the Klissura gorges and the narrow channel of the Iron Gate, where this breach takes place, unfortunately make the Danube useless as a means of communication between the Romanian and the Hungarian Plains.

From the grasslands of Asia Mongol peoples in times past have swept westwards to the Plain of Hungary, the last-comers being the Magyars, or Hungarians. They became partners with the Germans of Austria in the empire of Austria-Hungary; but after the Great War their

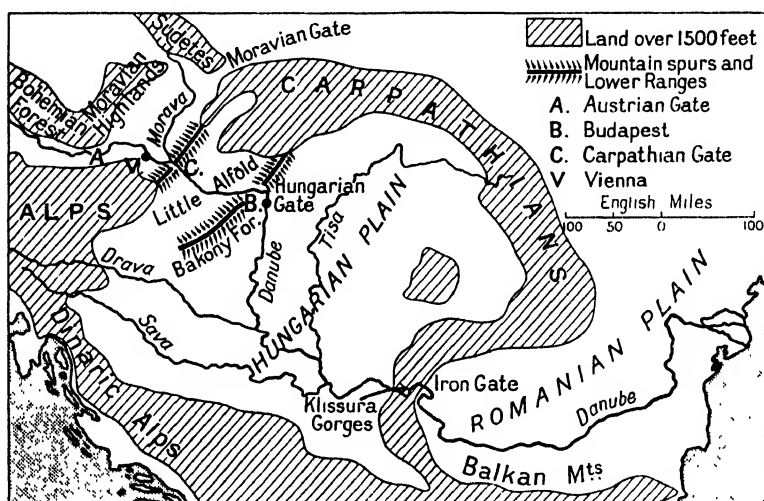


FIG. 71.—Basin of the Danube from the Austrian Gate to the Black Sea.

territory was reduced from the size of the British Isles to that of Ireland. Romania gained much territory at Hungary's expense, doubling her pre-war area and population, and extending her frontiers across the Carpathians into the Hungarian Plain, and north-eastwards to the Dniester River. Hungary to-day has an area of 35,000 square miles and 8,683,000 inhabitants, with **Budapest** (1,004,000) as capital, situated on the Danube below the Hungarian Gate, on which routes converge across the Hungarian Plain. Romania has an area of 122,000 square miles, and a population of 18,025,000. **Bucharest** (631,000), its capital, has railway connection across the

Danube with the ice-free port of Constantza on the Black Sea.

The Hungarian and Romanian Plains both have long, hot summers and cold winters. Rainfall varies from 15 inches annually in the Danube delta to 25 inches in the Romanian Plain (Fig. 63), most of the rain coming in summer.

Hungary grows **wheat** for export on her level lands, and **maize** where the surface is rougher, chiefly as food for her people. These cereals, along with **rye**, barley, and oats, occupy 45 per cent. of the total area of the country. On the Hungarian Plain graze large herds of **cattle** and **horses**, while the maize crop is utilised to feed **pigs**. In the Little Alföld agriculture does not take the form of cereal-production so exclusively as in the Hungarian Plain, but rather resembles the dairying type of Western Europe, raising eggs and poultry for neighbouring industrial markets in Austria, Czechoslovakia, and Germany, and including sugar beet and potatoes in the rotation of crops. There are important fisheries in the Danube and Tisa rivers and in Lake Balaton. Hungary has some coal and iron ore, but her chief industries are based on agriculture. They include flour-milling, distilling, and the manufacture of sugar.

Romania also has **wheat** and **maize** as her most important crops, her production of maize being surpassed only by the United States and Argentina. She raises more **barley** and **oats** than Hungary, 34 per cent. of her total area being under cereals. In the province of Bessarabia (between the Prut and Dniester rivers) **plums**, cherries, and walnuts are grown for export; and Romania comes fourth amongst the countries of Europe (after France, Italy, and Spain) in the production of **grapes**. She has more **cattle**, sheep, and **horses** than Hungary, and nearly as many pigs. About a quarter of the total area is covered with **forests**, in and near the Carpathians. Agricultural products (sent to Austria and Czechoslovakia) compose 36 per cent. of Romania's exports; live animal and animal

products compose 10 per cent. ; and wood products (sent to Hungary) compose 13 per cent.

Romania's most important mineral is **petroleum**, of which she has the fourth largest production in the world. The oil-fields occur in the north-eastern foothills of the Carpathians. She is probably the richest country of Europe in **salt**, and also mines coal, iron, and copper. Local raw materials supply industries of flour-milling, brewing, distilling, the manufacture of chemicals (including fertilisers), of woollens, and of paper. The chief grain port is Salina, at the mouth of the Danube ; a pipe-line conveys petroleum from the refineries at Plöesti to the Danube port of Guirgiu.

(d) **GERMANY**

The north front of the Hercynian mountains (Fig. 61) follows the Ardennes-Westerwald to the Harz, and thence turns south-eastwards to the Bohemian mountains, dividing Germany into **northern lowland** and **southern highland**. The highland has such varied relief that politically it became divided between the numerous states of Southern Germany, while the level expanse of the lowland favoured the attempt of Prussia to form the whole German plain into a single state. The absence of good natural frontiers in the plain made Germany in self-defence become a great military power. In military and in economic development she was greatly aided by the minerals that lie along the edges of the Hercynian plateaus.

Germany has an area of 180,000 square miles, and a population of 62,410,000 (345 per square mile). Prussia, the largest German state, has 38,175,000 inhabitants ; Bavaria has 7,370,000, Saxony nearly 5,000,000, Württemberg and Baden each over 2,300,000.

During the Ice Age the ice-sheet from Scandinavia carried mud, sand, and boulders over the European Plain. When the ice began to melt, this material was deposited, here as level tracts of boulder-clay, affording fertile soil, there as sand and gravel stretches (Geest), which became

covered with fir forests or heath. As the climate grew warmer, the ice-sheet shrank northwards. A great "terminal moraine," the Baltic Ridge, running from Kiel to the western elbow of the Oder, and then north-eastwards into Russia, marks a temporary resting-place of the ice-front in its retreat (Fig. 75).

The rivers of Central Germany were blocked by the ice-sheet from draining northwards. They became tributaries of a great river which flowed north-westwards along the ice-front, and discharged its waters by the Weser or the Elbe into the North Sea. The west or north-westward stretches of the present rivers of the plain (Fig. 72) indicate the valleys cut by this river at different periods. These



FIG. 72.—Rivers of Northern Germany.

valleys have facilitated the development of waterways, both natural and artificial, and made possible the construction of an east-west system of canals to link together the north-south courses of the main rivers. After the ice disappeared, two rivers cut back their courses from Stettin and Danzig, "captured" the Oder and Vistula at their western elbows, and caused them to flow to the Baltic instead of to the North Sea.

It is a disadvantage to Germany that three-fourths of her coast-line faces only the enclosed waters of the Baltic. The **Elbe** is the only great German river that has its outlet to the North Sea; for the mouth of the **Rhine** lies in Dutch territory, although it is a German river for the greater part of its course. At Basle the Rhine turns sharply northwards between the wooded highlands of the

Vosges and the Black Forest, and for 220 miles, as far as the Basin of Mainz (Mayence), flows through a **Rift Valley**, which has sunk between these two ancient Land Blocks (Fig. 73). For about 100 miles north of Basle the Rhine

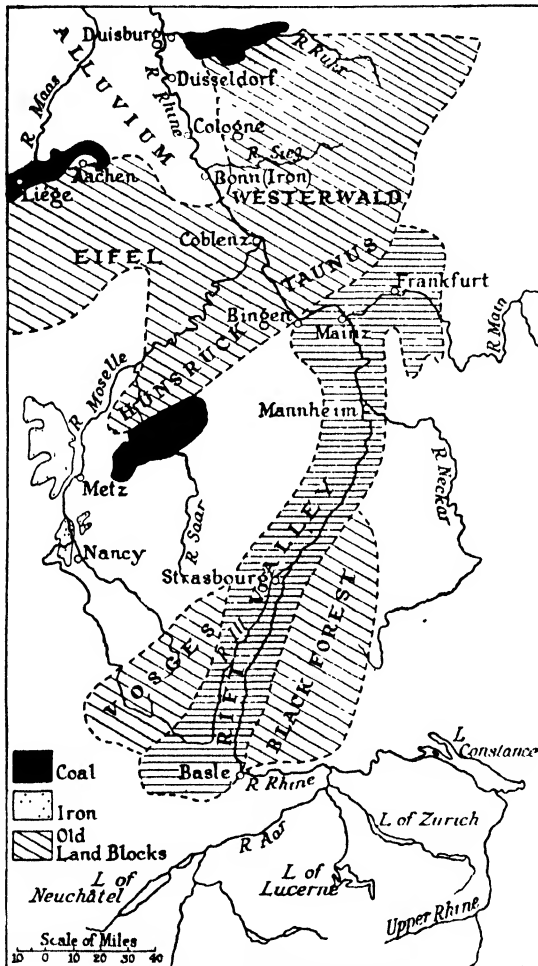


FIG. 73.—The Rhine Valley.

forms the frontier between France and Germany. Between Bingen and Bonn it flows through another Hercynian highland area, first between the Hunsrück and the Taunus uplands, next between the Eifel and the Westerwald. At Bonn its valley opens into the European Plain.

AGRICULTURE IN GERMANY

Agriculture in some form is practised over 63 per cent. of the whole area of Germany, 44 per cent. being arable land, $1\frac{1}{2}$ per cent. vineyards, orchards, and market gardens, and $17\frac{1}{2}$ per cent. grass and pasture. In addition, 27 per cent. of the total area is covered with forests (largely in Bavaria). The average annual rainfall over the whole country is about 28 inches. Along the North Sea coast is a narrow strip of alluvial polders (Marschen), bordered

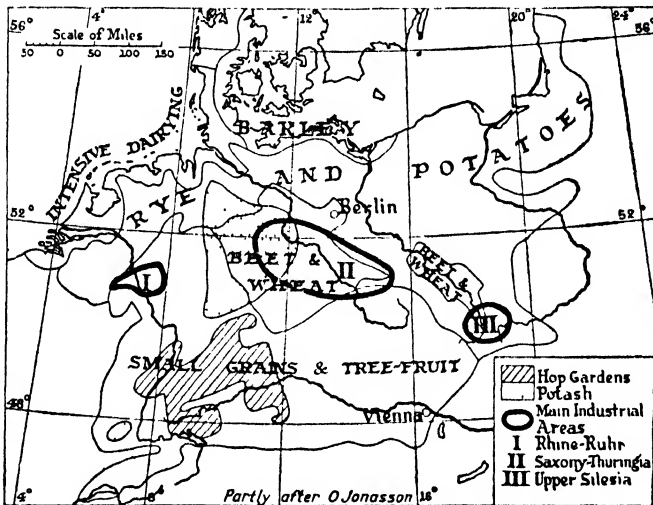


FIG. 74.—Agricultural and Industrial Regions of Germany.

inland by Geest, which is natural meadowland. This area receives much rain in late summer and early autumn (August to October), which is unfavourable for the harvesting of crops, but favourable for pasture. This is accordingly a district of intensive **dairying** (Fig. 74) and the raising of beef cattle. In the western Baltic coast-lands barley is a main crop, and horses and beef and dairy cattle are pastured in large numbers. These two districts receive more than 60 per cent. of their income from **live stock**.

Southward of these coastal areas the climate is drier and warmer, except in mountainous districts, and crops are proportionately more valuable than in the north. Two

areas, lying round the middle course of the Elbe and the upper course of the Oder, have finely grained soils, laid down near the farthest limits reached by the Ice Sheet (Fig. 61), which are favourable to the cultivation of **sugar beet and wheat**, waste material from the beets being used to feed cattle. North of these districts **rye and potatoes** are typical crops suited to the more sandy soils and the cooler climate. Southern Germany contains many warm, dry, fertile valleys, where intensive cultivation of wheat and barley takes place, with oats on the more moist and cooler northern slopes. The valleys of the Rhine and its tributaries, the Moselle, Main, and Neckar, have a warm summer climate (July temperature of Frankfurt, 67° F.), and contain many orchards and **vineyards**. **Hop gardens** spread over Baden, Württemberg, and Bavaria.

MINERALS, INDUSTRIES, AND INLAND CITIES OF GERMANY

In increasing the yield of her fields Germany has largely utilised as fertilisers her vast deposits of **potash**, production of which takes place chiefly round the Harz mountains and in Thuringia, north-west of the Bohemian highland. The German potash mines furnish two-thirds of the world's supply. Besides its value as a fertiliser, the potash is used industrially in the manufacture of soap, glass, matches, and chemicals.

Three great industrial areas have been developed along the mineral-bearing edges of the Central Hercynian Highlands (Fig. 74), and a fourth in southern Germany.

(1) The **Rhine-Ruhr** area. Notice in Fig. 73 the Ruhr and the Aachen-Belgian coal-fields lying north respectively of the Westerwald and Eifel highlands. Important iron deposits in the Sieg valley adjacent to Ruhr coal, water transport on the Ruhr River for heavy mineral goods, and ease of communication across the European Plain to all parts of the world have made the Ruhr a huge "Black Country," with eight cities of over

250,000 inhabitants. Krupp's works are at **Essen** (629,000), the centre of the **steel and iron** industry. **Dortmund** (525,000), **Gelsenkirchen** (330,000), and **Bochum** (313,000) specialise in mining and smelting. **Düsseldorf** and Hagen produce hardware, Wuppertal (**Barmen-Elberfeld**—405,000) laces, ribbons, and printed calicoes, and **Krefeld** silk. The outlets of this district are the **Rhine ports** of **Duisberg** (421,000), **Düsseldorf** (464,000), and **Cologne** (700,000), the head of ship navigation on the river.

In the Rift Valley large cities have developed only where a side valley opens on to the great north-south route it provides. On **Frankfurt** (540,000) converge railways from the Elbe, the Danube, and the Rhine. **Mannheim** (247,000), at the confluence of the Neckar, the head of navigation except at high water, is the wholesale depôt for all Southern Germany in grain, oil, and coal.

(2) **Saxony-Thuringia.** These two states occupy the northern slopes of the Ore mountains and of the Thuringian Forest. Coal from the lignite fields which they contain is used to generate electric power for **textile industries**. The Harz mountains yield iron and copper ores. **Chemnitz** (335,000) is the cotton metropolis of Germany. Chemnitz and **Dresden** (625,000) manufacture machinery; while **Leipzig** (684,000) is one of the greatest centres of **printing** in the world. Round **Stassfurt** in the potash area are many **chemical** factories, while **Magdeburg** (297,000) and **Hanover** (425,000), in the wheat and beet district of the Middle Elbe, manufacture sugar.

(3) **Upper Silesia.** As a result of the Great War Poland obtained three-quarters of the Silesian coal-field in the upper basin of the Oder. In the industrial area which remains to Germany, Gleiwitz, which has large **glass** works, is the most important town. **Breslau** (599,000), situated at the head of navigation on the Oder, and in the centre of the wheat and beet district on that river, has many sugar factories.

(4) **Southern Germany,** which has little coal, has

developed hydro-electric power, notably by making use of the mountain lakes of Bavaria. Here **Munich** (685,000), the capital of Bavaria, stands at the junction of the Brenner route *via* the Isar valley with the Basle-Vienna route along the foot-hills of the Alps. It is a centre of brewing, chemical, and electrical works, using local hops, salt deposits, and water power. The production of beer in Germany per head of the population is equal to that of wine in Italy. Augsburg and Stuttgart are the leading textile towns, while Regensburg and Passau are distributing centres on the Danube.

Germany has no natural centre, such as France has in the Paris Basin. **Berlin** (4,024,000) has become the capital through the successful struggles of Prussia. This city has a central position in the northern lowland, half-way between the Elbe and the Oder, and half-way between Hamburg and Breslau. Its location on the Spree makes it naturally the centre of the waterways of Prussia ; and it has become the centre of the Prussian railway system. Its industries, which include clothing and machinery, make it the chief manufacturing town of Central Europe.

SEAPORTS AND TRADE OF GERMANY

Half Germany's overseas trade passes through **Hamburg** (1,226,000), which stands at the south-eastern corner of the North Sea, 60 miles up the Elbe (the farthest point attainable by ocean steamships). On the estuary of the Elbe all the inland navigation of Germany converges. Hamburg builds ships, mills imported grain, and handles all the tropical products received from overseas. As a seaport, the city has no rival in Germany. The Weser, on which **Bremen** (338,000) stands 50 miles up-river, is much narrower than the Elbe, although the advantage of being nearer the Atlantic than Hamburg has given Bremen control of the import trade in tobacco and cotton, while it also serves as outlet for the potash district. The Ruhr iron industry would naturally have its outlet by the estuary of the Rhine. As this estuary is under Dutch control, the

Dortmund-Ems canal carries much of the Ruhr trade to **Emden**.

On the Baltic coast **Stettin** (254,000) is the seaport nearest Berlin. It specialises in shipbuilding and in sugar and grain industries, also exporting coal from Silesia. Between the Oder mouth and the Jutland peninsula no large river enters the Baltic ; but the bays of Lübeck and Kiel, at the base of that peninsula, provide the best harbours on the German Baltic coast, Kiel being the terminus of the **Kiel Canal**, which connects the Baltic with the North Sea.

Germany's exports are composed as follows : manufactured articles, 77 per cent. ; raw materials, 19 per cent. ; food, 4 per cent. Imports consist of : manufactured articles, 18 per cent. ; raw materials, 52 per cent. ; food, 30 per cent. The largest exports are iron and steel goods, in the output of which Germany is surpassed only by the United States and France, textiles, chemical products, coal, and paper. The largest imports are raw cotton and wool, mineral ores, petroleum, coffee, and butter.

(e) **POLAND**

The European Plain between the Carpathians and the Baltic is occupied by Poland, which has an area of 139,000 square miles and 31,927,000 inhabitants. Except for the Carpathians in the south, most of the country is flat, and the only hills are three terminal moraines, left by the glaciers of the Ice Age. The central of these, extending from Berlin by Poznan and Warsaw to Vilna, has been utilised as a railway route between Germany and Russia. The glaciers laid down a soil of boulder-clay, and marshy conditions prevailed for thousands of years after the Ice Age. Thus, until the Middle Ages, much of the land was water-logged or densely forested. Early settlement took place in the open valleys of the Warta (Warthe) and the Vistula (Fig. 72), where arose the cities of Poznan, Cracow, Warsaw, and Danzig. Practically the whole drainage basin of the Vistula, from the crest of the Carpathians to the

Baltic, lies within Polish territory. It is the Vistula which gives unity to Poland.

The Poles belong to the Slav race. Their history is largely the story of their struggles with Germany in the west and Russia in the east—struggles that have been partly caused by the absence of natural frontiers on the European Plain. On the north the German territory of East Prussia practically shuts the country off from the Baltic. To secure to Poland access to the sea, a strip of territory reaching the Baltic coast west of the mouth of the Vistula has been taken from Germany, and given to Poland. This “**Polish Corridor**” unfortunately cuts off East Prussia from land communication with the rest of Germany. **Danzig**, at the mouth of the Vistula, has been made a Free City, to serve as a harbour for Poland; but the Poles, dissatisfied with this neutral port, have created a new seaport of their own at Gdynia, and are building a railway through Polish territory between Gdynia and their coal-field in Upper Silesia.

Poland is essentially an **agricultural** country. Rye and potatoes are the leading crops (Fig. 74), 40 per cent. of the whole area being under tillage. Forests occupy 23 per cent. of the area, mainly in the north, where the Westerly Winds penetrate across the European Plain between the Scandinavian highland and the Carpathians, and produce a more moist climate than in the south, which belongs to the region of sugar-beet and winter grains (Fig. 76). The presence of a large industrial population in western Poland has caused the rise of a dairy industry. In addition to many cattle, Poland also possesses large numbers of horses and pigs.

Poland's economic existence, however, depends upon **two industrial belts** of dense population that cross the Vistula approximately at right angles. The northern belt runs from **Poznan** (Posen—246,000 pop.) by **Lodz** (605,000) to the capital, **Warsaw** (1,178,000), and Bialystok; the southern runs from the mineral field of Upper Silesia through **Cracow** (221,000) and **Lwow** (Lemberg—316,000).

The northern belt includes agricultural and textile industries, Lodz specialising in cotton, Warsaw in hardware, leather, lace, sugar, and distilling. The southern belt contains the Upper Silesian coal-field, zinc, salt, and deposits of petroleum in the foothills of the Carpathians, which are continuous with those of Romania. Poland has the sixth largest coal production in the world.

(f) CZECHOSLOVAKIA

In contrast to the European Plain, with its lack of definite natural boundaries, the highland of **Bohemia** is a marked physical unit. Disturbance of the earth's surface has uplifted its edges as the Sudetes and the Bohemian Forest on the north-east and the south-west, and as the Ore mountains and the Moravian Highlands at right angles to them. The rivers of the highland, rising on the inner slopes of the mountains, are collected either by the Elbe (Labe) or by its tributary, the Moldau (Vltava). The Elbe issues from the highland on to the European Plain through the Saxon Gate, between the Ore mountains and the Sudetes.

The Bohemian highland is the country of the Czechs, who obtained their independence on the downfall of the empire of Austria-Hungary. In addition to Bohemia, Czechoslovakia includes most of **Moravia** (the basin of the Morava, p. 291) and the southern slopes of the Carpathians. This last area is known as **Slovakia**, from its inhabitants—the Slovaks, who, like the Czechs, belong to the Slav race. Czechoslovakia is long and narrow—600 miles in length by, at most, 160 miles wide. Its area is 54,000 square miles; and it contains a population of 14,726,000. With a density of 272 persons per square mile, it is more closely settled than any country of Central Europe except Germany.

One-third of the country is cultivated, and one-third forested, Bohemia and Moravia containing most of the farms and Slovakia most of the timber. Rye, oats, and wheat are the principal grain crops, and a large acreage is under potatoes, which form the chief food of the people. Hops are grown for the making of Pilsener beer; plums

and tobacco are also raised in considerable quantities. The alluvial valleys of the Elbe below Kolin, the lower Ohře (Eger), the Morava, and the Vah (Waag), which have only about 20 inches rainfall, specialise in the cultivation of **sugar beet**. Germany is the only country in Europe which exports more sugar than Czechoslovakia. Pulp made from the waste products of the beets helps to feed 4,500,000 cattle.

Czechoslovakia's density of population is, however, due to the fact that it is as much **industrial** as agricultural. It possesses a share of the Upper Silesian (bituminous) coal-field, and also mines bituminous coal in the valley of the Beroun River, a tributary of the Vltava, and lignite in the Ohře basin. These fuel resources, together with facilities for the development of water-power and the right to use the Elbe, the Oder, and the Danube for transport, cause 38 per cent. of the population of Bohemia and Moravia to be employed in industry. Food and raw materials are imported from Hungary and Rumania in exchange for hardware, textiles, and agricultural machinery, while specialised products, such as china, glass, and equipment for sugar works and breweries, are exported to Germany, Austria, and countries of Western Europe.

The iron industry is located near the bituminous coal-fields; the porcelain industry is in western Bohemia round Karlovy Vary (**Karlsbad**); while glass manufacture centres mainly on the sand-bearing rocks of the Sudetes. Textile factories are situated along the foothills of the border mountains near power facilities from water and coal. **Prague** (848,000), the capital, shares in most of these industries, from its proximity to the Beroun coal-field, from its advantages for transport (as head of navigation on the Vltava and as a railroad centre), and from the fertility of its valley. **Brno** (Brünn—263,000), the largest city in Moravia, has woollen and stove-manufacturing works. More than half the exports of Czechoslovakia are manufactured products, including textiles (25 per cent.), iron goods (11½ per cent.), glass, and sugar.

EXERCISES IV

A

1. On an outline map of Switzerland and district mark and name :
(a) Jura, Mont Blanc, the passes Mont Cenis, Simplon, St. Gotthard, Brenner, Semmering ; Lakes Geneva, Lucerne, Constance.
(b) Geneva, Zurich, Basle, Lausanne, Berne.
2. On a blank map of Germany insert the names :
(a) Vosges, Alps, Harz, Black Forest.
(b) Trace these rivers—Rhine, Elbe, Oder, Danube.
(c) Mark and name the towns—Munich, Frankfurt, Cologne, Essen, Berlin, Leipzig, Breslau, Chemnitz, Hamburg, Stettin.
3. Point on your map to : Carpathians, Silesia, Thuringia, Saxony, Bavaria, Bohemia, Prussia, Budapest, Prague, Vienna, Bucharest.
4. In two columns tabulate the differences in land-structure, occupations, and productions between (a) the Upper, and (b) the Lower Rhine.
5. What are the (a) industrial, and (b) agricultural products of Switzerland ? What other sources of wealth has Switzerland ?
6. What are the advantages and the disadvantages of the Danube as a highway of traffic ? Compare it in this respect with the Rhine and the Oder.
7. Name those products which Romania and Hungary have in common. What does Romania produce in addition ? Which of the two is the wealthier, and why ?
8. Name the towns or districts in Germany noted for : chemicals, books, coal, cottons, beer, beet-sugar, shipbuilding, dairying, potash, vineyards, steel-works, silk.
9. Name the five principal products of Poland, and name the districts in which these are found along with their manufactures.
10. With what articles does Czechoslovakia supply Europe ? What does she provide for her own needs ?

B

1. Contrast Austria with Switzerland as regards (a) area, (b) nature of land relief, (c) location on " through " routes, (d) occupations of inhabitants.
2. Draw a sketch map of the Rhine basin. (a) Block in and shade highlands ; (b) Insert tributaries ; (c) Show clearly the position of gaps permitting railway and canal connections

with France ; (d) Mark the coal-fields ; (e) Insert the chief towns.

3. Write short notes on : Baltic Ridge, Geest, Kiel Canal, the Little Alföld, Lignite, the Ruhr, Föhn Winds, " Alp " pastures.
4. What is meant by the " Polish Corridor " ? What ports has Poland ?
5. Has Czechoslovakia a good position for trade ? Compare her in this respect with Switzerland.
6. Examine the positions of Marseilles, Genoa, Salonika, Constantinople, Hamburg, Vienna, Milan, and say what seem to be the general conditions that influence the rise of a great commercial centre.

THE NORTHERN BALTIC LANDS

The lands on the northern shores of the Baltic Sea contain three great valleys, two of which are directed

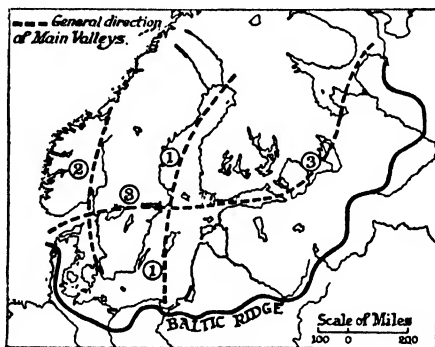


FIG. 75.—Main Valley Trends in Baltic Lands.

roughly from north to south, while the third cuts across them approximately from west to east (Fig. 75). These valleys are represented by :

- (1) The Gulf of Bothnia and the eastern Baltic Sea to the Gulf of Danzig ;
- (2) The Trondheim-Oslo valley and the Kattegat (p. 285) ;
- (3) The Skaggerrak—Lakes Väner and Mälär—the Gulf of Finland—Lakes Ladoga and Onega—the White Sea.

Round these three great valleys the northern Baltic

countries centre, as we have already found Norway and Denmark centring on the Trondheim-Kattegat valley.

Country.	Area (sq. miles).	Population.	Capital.
Sweden . . .	173,000	6,141,000	Stockholm.
Finland . . .	132,000	3,658,000	Helsinki.
Estonia . . .	18,000	1,117,000	Tallinn.
Latvia . . .	24,000	1,900,000	Riga.
Lithuania . . .	21,000	2,367,000	Kaunas.

All these countries lie east of the mountain backbone of the Scandinavian highland, which shuts off the warming influence of the Westerly Winds that blow across the Gulf Stream Drift (p. 251). Their climate is thus of continental type, with a great range of temperature and chiefly summer rainfall. For months in winter the Gulfs of Bothnia and Finland are frozen over, although some harbours are kept open by ice-breakers, and inland water transport is everywhere interrupted by ice. In general, sea-borne trade with the eastern Baltic is possible only from May to October.

(g) SWEDEN AND FINLAND

These two countries, west and east of the Gulf of Bothnia, are both crossed by the belt of Temperate Coniferous Forest (mainly pine and spruce); the south of Sweden belongs to the beech forest belt of warmer latitudes (Fig. 64). Forests cover more than half of Sweden and nearly three-quarters of Finland. **Timber and timber products** (resin, tar, wood-pulp, paper, cellulose, etc.) form 45 per cent. of the exports of Sweden and 83 per cent. of those of Finland. Finland is the greatest exporter of sawn timber in the world.

Both countries have splendid facilities for developing **hydro-electric power** to drive the machinery of their sawmills, pulp factories, and paper works. During the Ice Age the centre of the Scandinavian ice-sheet lay to

the east of the present water-parting ; and the enormous erosive force exerted by the ice to force its way westwards between the highest peaks dug out hollows in the rock surface, which now remain as " glint " lakes, as is seen from study of a physical map. In Finland, lakes—to the estimated total of 100,000—are the most prominent feature of the landscape. In addition to their value as reservoirs for hydro-electric plants, these lakes of Finland provide excellent waterways, several of which have been connected by canals to the coast.

Finland has little arable land. Considerable quantities of grain have to be imported from the United States, the Soviet Union, and Poland. The southern tip of Sweden—Scania—does not belong to the Core of ancient rocks, but forms a detached part of the European Plain (Fig. 61). This district raises wheat and barley, the latter being largely used to fatten pigs. In the central lake-plain **oats**—the main Swedish cereal crop—and rye are grown. From both districts dairy products are shipped to industrial markets in Western and Central Europe.

Finland has only a small production of minerals ; but Sweden mines 11 per cent. of the **iron ore** of Europe. The two main iron-fields are (1) the Central field, between Lake Vänern and the Gulf of Bothnia, the ore of which is smelted with charcoal for a local iron and steel industry ; and (2) the Lapland field, the product of which is almost entirely exported, chiefly to the Ruhr, but also to Great Britain. As Luleå, the Bothnian port for Lapland ore, is ice-bound in winter, a railway has been built from the mines to the Norwegian ice-free port of Narvik.

With the exception of industrial centres in central Sweden, of which **Norrköping** is most important, most towns of any size in these two countries are seaports. **Stockholm** (502,000) and **Göteborg** are situated respectively on the eastern and the western side of the Swedish central lake-plain ; Malmö (127,000) nearly faces Copenhagen across the Sound (p. 286). **Helsinki** (Helsingfors—241,000), situated on the northern shore of the Gulf of

Finland, has railway connections which make it the distributing centre for a large part of Finland, and bring to its well-equipped harbour most of that country's import trade. In the export of sawn timber and other wood products it is surpassed by Kotka and Viipuri (Viborg), which lie farther eastwards along the Gulf of Finland, and are connected with the interior of the country respectively by river and canal.

Great Britain is the best customer of both countries, while Germany has the largest share of their import trade.

(h) **ESTONIA, LATVIA, LITHUANIA**

Before the Great War these three countries formed part of the Russian Empire. Unlike Sweden and Finland, they belong wholly to the European Plain. They have, therefore, a larger proportion of arable land. In Estonia and Latvia **oats** are the chief crop, followed by rye; in Lithuania **rye** covers a larger acreage than oats. All three countries cultivate **flax**. All three also export dairy products and **timber**, Germany and Great Britain receiving the largest proportions of their export trade.

Tallinn (Revel—131,000 pop.) faces Helsinki across the Gulf of Finland, while **Riga** (377,000) and **Memel**, the seaport of Lithuania, are on the seaboard of the eastern Baltic (p. 309).

EASTERN EUROPE : THE SOVIET UNION

East of the Carpathians the European Plain broadens out from 350 to 1200 miles; and here the European territory of the Union of Socialist Soviet Republics occupies a vast square of lowland between the Arctic Ocean, the Caucasus, and the Black Sea, divided by the physical (but not political) boundary of the Urals from the Soviet empire in Asia. The dominions of the U.S.S.R. are about equal in area (8,241,000 square miles) and population (161,000,000) to the whole of North America.

In addition to the Russian Socialist Federal Soviet Republic (which contains 82 per cent. of the total area and

68 per cent. of the population), and to the four Asiatic republics of the Soviet Union (p. 243), two European republics belong to the Union. These are **White Russia** (48,000 square miles, 4,983,000 pop.) and **Ukraine** (174,000 square miles, 29,020,000 pop.). Their respective capitals are **Minsk** and **Kharkov**.

The dominant physical feature of Soviet territory in Europe is uniformity. From a central plateau averaging 800 to 900 feet in height there is a gradual slope in all directions, rising again to the Carpathians, the Caucasus, the Urals, and the plateau of Finland. The ice-sheet, which spread southward to within 200 miles of the Black Sea (Fig. 61), covered this area with boulder-clay and sand. In the dry period which succeeded the retreat of the ice, the finer soil from the glacial deposits was swept up by the winds and laid down as a broad belt of loess. Here grew grasses and bushy plants, which, decaying, added black humus to the loess, and created the fertile soil of the **Black Earth** district.

Into these deposits the rivers cut deep ravines. The **Volga** (2325 miles in length) and its tributary, the Oka, the **Dnieper** (1410 miles), the West Dvina, and the Lovat-Volkhov, all radiate from the north-west of the central plateau. The sources of the **Don** (1325 miles) interlace with those of the Oka, as do those of the Kama with the North Dvina and the Pechora. Thus from ancient times the rivers of Russia have been her highways, and have contributed powerfully to the union of this vast area.

To uniformity of relief is added uniformity of climate. Though the country extends through 30° of latitude from north to south, everywhere winter is long and cold, nearly everywhere summer is hot. The annual range of temperature at Moscow is 53° F. A large area in the north is frost-bound for six to nine months; only the extreme south has less than three months' frost. This means a short growing season for crops (180 days round Moscow), and greatly lessens the value of the rivers for transport. When the snows melt in spring, cart-roads resemble streams. No-

where, save in the Caucasus, does rainfall exceed about 28 inches in the year (Fig. 50).

There are huge areas with little variety of plant life. The vegetation belts are (1) **tundra** in the cold north, succeeded southward by (2) **cone-bearing forest**. Then (3) comes **deciduous forest** (with oak and elm—not beech, for which characteristic tree of Maritime Europe the climate

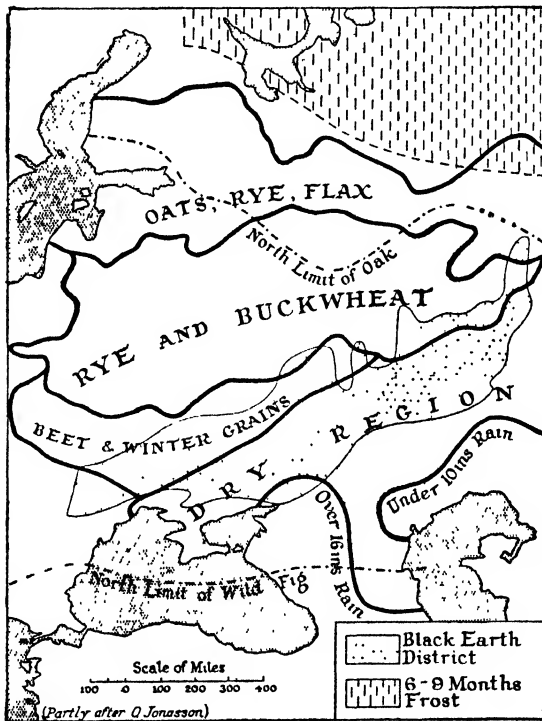


FIG. 76.—Agricultural Regions of the Soviet Union.

is too extreme) in the important belt reached by the westerly winds in summer, where they penetrate inland between the Caucasus and the Scandinavian highland. When cleared, this oak forest land is suited for grain, apple, pear, and cherry cultivation. Next comes (4) a **Dry Region**, with less than 16 but more than 10 inches average annual rainfall, which is apt to suffer from variation in the amount of moisture it receives.

The isthmus between the Black Sea and the Caspian shares in the **Mediterranean** type of vegetation, as shown by the presence of the wild fig, though not of the olive (Fig. 76).

The Russian grassland is continuous with the grasslands of Central Asia ; and Mongol nomads, pouring westward by this route, in the thirteenth century conquered Russia, and ruled it for 240 years. When the Mongol power declined, Moscow took the lead, from its central position between the Caspian and the Baltic, the Black and White Seas. With the rise of Moscovy, population began to move first southward, following the trend of the great rivers, and then eastward. One-quarter (chiefly Slavs) of all emigrants from Europe between the fifteenth and the twentieth centuries spread eastwards into Eurasia, relieving Europe from further danger from the nomads of the grasslands, and giving Russia her vast empire.

Only relatively small stretches of coast on the Black and Caspian Seas and on the Arctic Ocean (Murman coast) have access to waters that never freeze. The Caspian is landlocked ; and the channel by which the Black Sea communicates with the Mediterranean is under the control of Turkey. Peter the Great " cut a window " for Russia when, in 1703, he built his new capital, St. Petersburg (Leningrad), at the head of the Gulf of Finland. But its site is unhealthy, and the Gulf is closed by ice for 150 days in every year.

Position, relief, and climate, the factors that stimulate progress elsewhere in Europe, have thus for centuries retarded advance in Russia. Summer heat and winter cold are both so great that they hinder mental activity ; and the life of the Russian peasants long continued almost unaltered and uncriticised.

AGRICULTURE IN THE SOVIET UNION

The Soviet Government is developing the agricultural resources of this vast country by applying to the production of crops the methods used in a great industrial factory.

The grasslands (Fig. 60) afford more favourable conditions for the use of such methods than any other region in the world. They consist, as previously noted (p. 244), of a northern Black Earth belt of exceptionally fertile soil (Fig. 76) and a southern, less fertile, belt of Chestnut-Brown soil. As the nature of soil depends largely upon climate, these belts run east and west across Eurasia, because rainfall decreases from north to south, whereas in North America they run north and south, because rainfall decreases from east to west (p. 115). The area of Black Earth soil—that is, first-class land for the production of **wheat**—in the Soviet Union is about five times as great as in the United States. These grasslands have the level, tree-less surfaces which make possible the employment of machinery for ploughing, sowing, and harvesting, and the organisation of “collectivised” peasant holdings and huge state farms, such as the “Giant,” which covers 667 square miles. The dry climate also means that the working of the machines can continue uninterrupted. These conditions give the Soviet Union the largest wheat crop in the world.

The northern part of the Black Earth belt, although well suited for wheat, is used to grow “**industrial crops**”—sugar beet, flax, hemp, soya beans, and sunflowers (the two last to supply fats and oils)—that normally require more moisture than this area receives. There is, however, no other region in the Soviet Union available for their production. The Dry Region raises wheat and **barley**, another grain in which the Soviet Union stands first in world production; its uncertain rainfall makes this region dependent for other resources upon slow-maturing crops, such as millet, which can utilise late rains.

From northern Russia the Soviet Union raises the world's largest production of **rye** and the second largest of **oats**, both of which cereals are more tolerant than wheat of a rainfall coming late in summer (Fig. 76). Buckwheat occupies relatively unproductive and undrained soils. The cultivation of **flax** and the **dairying** industry are being developed in a belt lying approximately south of the

60th parallel of north latitude and north of a line drawn from Minsk through Moscow to Kazan.

Forests cover nearly 40 per cent. of the whole surface of the Soviet Union, including 630,000 square miles in Europe (one-fifth of the forested area). **Timber** supplies 90 per cent. of all building materials and 95 per cent. of all fuel ; timber and wood-pulp are exported.

MINERALS AND INDUSTRIES IN THE SOVIET UNION

The population of the Soviet Union is increasing at the rate of 3,250,000 per year. An increased yield from agriculture is therefore necessary to feed the growing population. The aim of the Soviet Government, however, is to make their country predominantly **industrial instead of agricultural**. To effect this change it is necessary to export agricultural produce, in order to purchase machinery abroad and to pay for the services of foreign engineers. Industrial production now accounts for 58 per cent. of the total production of the Soviet Union, and agricultural production for 42 per cent.

The Soviet Union's output of **coal** is surpassed only by the United States, Great Britain, and Germany, and its output of **iron** and **steel** only by the United States, France, and Germany. It has the largest production in the world of manganese and platinum, the second largest of **petroleum**, and the fourth largest of gold. On the other hand, its European territory has almost no lead, zinc, tin, or copper. About 3 per cent. of the world's copper is mined in Soviet territory in Asia. As most of European Russia is a low plain with a scanty rainfall, it has naturally little chance of developing hydro-electric power.

There are three main areas of industrial development :

(1) The **central area** round **Moscow** (2,412,000 pop.), the capital, which is the centre of the railway system. This is the main **textile** area, and contains the Tula coal-field. It extends north-westwards to **Leningrad** (1,614,000) and eastwards to Kazan on the Volga, and contains six industrial cities with more than 100,000 inhabitants (Tver,

Yaroslavl, Ivano-Voznesensk, Gorky or Nijni-Novgorod, Kazan, Tula).

(2) **Ukraine**, which includes the Donetsk coal-field near the Sea of Azov, and the one great hydro-electric power station in the Soviet Union—the Dnieprostroi plant, constructed at the great eastern bend of the Dnieper, where the river crosses a low granite ridge. This area also contains the iron-field of Krivoi Rog, near Kherson, and manganese mines at Nikopol. It produces about 70 per cent. of the Soviet's **pig iron**. Because of the important agricultural production of the Black Earth belt, this area has also the largest output of **agricultural machinery** (such as tractors) and of **beet sugar**. **Kharkov** (729,000) is the largest city in this area, which extends from **Kiev** (573,000) on the Dnieper and the seaport of **Odessa** (420,000) on the Black Sea to the western elbow of the Volga, and contains five other industrial towns with populations between 300,000 and 100,000—Nikolaev (on the Bug), Rostov, Dnepropetrovsk, Stalingrad, and Voronezh (on the Don).

(3) The **Ural** area, with **Sverdlovsk** (136,000) as its centre, extends on both sides of the Urals in the neighbourhood of the Trans-Siberian Railway. It contains a coal-field north-east of Perm, **copper** and **platinum** mines, the great new **steel** works of Magnetogorsk, and factories for the making of agricultural machinery at Cheliabinsk.

COMMUNICATIONS IN THE SOVIET UNION

A railway network has been developed only in the west. Districts in the interior had little to export in the past, and little money to spend on imports, while the lack of good, ice-free seaports discouraged foreign trade. Thus, except in the west, railway communications depend upon a few trunk lines. There is a general shortage of rock for "road metal"; and the bad state of the unmetalled roads discourages motor transport. Throughout one-half of Soviet territory transport depends upon camels, dogs, and reindeer. For the shipment of grain the Black Earth belt

is advantageously situated, as it is crossed by the navigable Dnieper, Don, and Volga, and lies close to ports on the Black Sea.

EXERCISES V

A

1. On a map of the Baltic Sea and the surrounding lands insert : Finland, Helsinki, Gulf of Bothnia, Lakes Mälär, Vänér, Bornholm, Gulf of Riga, Riga, Stettin, Danzig, Stockholm, Malmö, Königsberg, Oslo, Trondheim, Narvik, Hammerfest, Bergen.
2. On a map of the Soviet Union mark and insert :
 - (a) Ural Mountains, Caucasus, Valdai Hills, Lake Ladoga, Ukraine.
 - (b) Trace the courses of : Volga-Oka, Dvina, Don, Dnieper.
 - (c) Moscow, Leningrad, Odessa, Archangel, Kiev, Kharkov.
 - (d) Write the name over an area of supply : wheat, sugar-beet, barley, rye, petroleum, coal, platinum.
3. Explain : "Black Earth," collectivised holdings, buckwheat, U.S.S.R., uniformity of relief, uniformity of climate.
4. How has Sweden overcome the difficulty arising from lack of coal ? Mention the industries which Sweden has developed.
5. (a) Why should a cross-country railway have been constructed from Luleå to Narvik ?
 - (b) Why should Bergen have a heavier rainfall than Stockholm ?
 - (c) Why should Baltic lands produce timber, rye, barley, oats, potatoes, rather than wheat ?
6. What are the main products of the following areas of the Soviet Union : Coniferous Forests, Deciduous Forest area, Black Earth Lands, Dry Region ?
7. Name any reasons for the poor development of railways and good roads in the U.S.S.R. What substitutes are available ?
8. Of what value to Finland are her thousands of lakes ?

B

1. Why should Helsinki receive most of Finland's imports, while Kotka and Viipuri ship most of her exports ?
2. Give a brief description of the river system of the Soviet Union in Europe. Illustrate your answer by a sketch map.
3. Compare and contrast the positions of Leningrad and Moscow as claimants to be the capital city of the Soviet Union.
4. "In variety of products the Soviet Union is at a disadvantage compared with the United States. In capacity to produce a few crops in large quantities at low cost, the United States is at a disadvantage compared with the Soviet Union." Explain this statement.

CHAPTER X

GREAT BRITAIN AND IRELAND

THE INFLUENCE OF THE BRITISH SEAS

OFF the north-western coast of Europe lies a group of islands, in which the two largest are Great Britain and Ireland. Dover Strait, about 20 miles across at its narrowest part, separates Great Britain from France. The Irish Sea and St. George's Channel separate Great Britain from Ireland. The larger island is about 600 miles in length and 300 miles in breadth at its widest part. Such distances, in early times when roads were few and bad, were sufficient to prevent the whole area from being ruled from a single centre, and **four nations**—English, Scots, Welsh, and Irish—grew up in the two islands.

The British islands are not surrounded by deep ocean, like Madagascar. They stand on the continental shelf of Europe, and are washed by relatively **shallow seas**. This shallowness of the British Seas, in the first place, **prevents** the deep, icy currents of the Arctic Ocean from reaching the coasts and **chilling the climate**. Secondly, the tides of the Atlantic, when they come to the edge of the continental shelf, are checked in speed, so that the crest of each wave tends to overtake the trough of the wave which has preceded it. The height of each is accordingly increased; and the rise and fall of the tides round all the shores which border the continental shelf become many times greater than on coasts which face the deeper ocean. Where the vales and basins of the English Lowland come to the coast-line the tidal currents enter the mouths of the rivers to form long **estuaries**, the chief of which are those of the Humber, the Wash, the Thames, Southampton Water, the Severn, and the Mersey. These estuaries discharge into

the sea the waters of nearly all the larger rivers of England. Similarly, most of the Central Plain of Ireland drains to the estuary of the Shannon, and the Rift Valley of Scotland to the Firths of Forth and Clyde. This means that up the river estuaries there set and ebb **powerful currents** twice every day, which can carry ships far inland. The outflow of the tides also acts with the seaward course of the streams in carrying away the silt which the rivers would otherwise have deposited, and helps to keep the estuaries scoured. A third result of the shallowness of the seas is that they provide **feeding grounds** for vast quantities of **fish**.

Until the discovery of the New World and of the Cape route to India, men thought of the British Isles as lying on the north-western margin of the world. When it was found that ships could voyage over the oceans to every part of the world, their true position became apparent as the **centre of the land masses of the globe**—a position which enabled their peoples, by means of naval power, to found a world-wide empire.

STRUCTURE AND RELIEF

Two of the three mountain systems of Europe—the North-West Core and the Central Hercynian Highlands—are represented in the British Isles (Fig. 61), while the English Lowland in the south-east belongs to the European Plain.

The Highlands consist of an Inner and an Outer circle enclosing the Irish Sea, and the highlands of north-west Ireland and Scotland along with the Scottish Grampians.

(a) The **Inner Circle** consists of (1) the Southern Uplands of Scotland, (2) the Mourne mountains in Northern Ireland, (3) the Leinster Chain in the south-east of the Irish Free State, (4) the Welsh Highlands, (5) the Cumbrian mountains, all of which date from what are known as the Cambrian and Silurian periods.

(b) The **Outer Circle** contains two highland and two lowland areas—(1) the Hercynian Uplands of southern

Ireland, South Wales, Devon, and Cornwall; (2) the Pennine Arch, (3) the Rift Valley of Scotland, (4) the Midland Limestone Plain of Ireland. In the north-east of Ireland, the Antrim Plateau is also a highland area. It was once part of a lava plateau, which stretched northwards to the Scottish islands of Mull and Skye. The beds of lava have cooled in the column-shaped cliffs of the

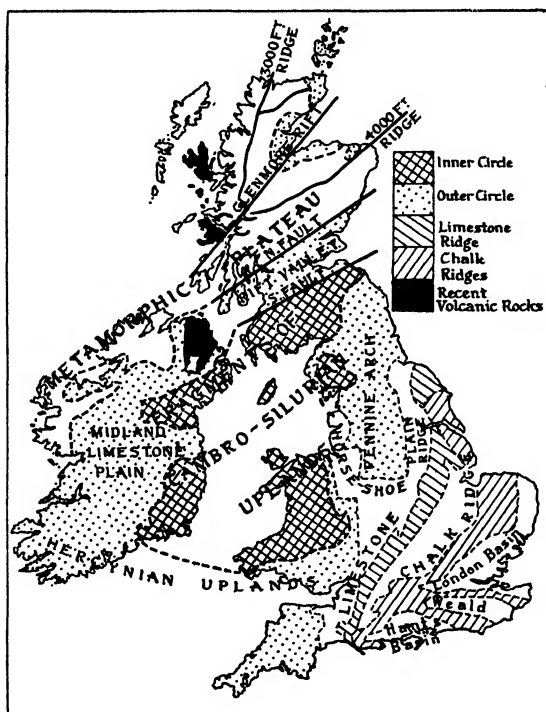


FIG. 77.—Structure of the British Isles.

Giant's Causeway in northern Ireland and of the island of Staffa near Mull.

(c) The third part of the Highlands of the British Isles is the **Metamorphic Plateau**, which stretches from north-western Ireland to the Grampian Highlands of Scotland. This Plateau was at one time a system of folded mountains, whose ridges ran from south-west to north-east. The pressure which folded the earth's crust hardened and meta-

morphosed, or altered the form of, the rocks, so that they were changed from sedimentary rocks into crystalline (pp. 51, 53). It caused also long fractures of the crust, such as the Glenmore Rift and the two "faults" across Scotland, from Helensburgh to Stonehaven, and from Girvan to Dunbar, between which the rock-floor sank as the Rift Valley. Later these mountains were worn down by erosion into plateaus; but they still remain highland areas of considerable elevation. In the north-east of the Scottish Highlands there are lowland areas in Orkney, Caithness, and round the shores of the Moray Firth, where the rocks were formed at the same period as rocks of the Outer Circle (Fig. 77).

These rocks of the North-West Core of Europe and of the Hercynian Highlands, hard and ancient, have largely resisted denudation by water and weather, and are the highlands of the British Isles. They enclose two lowlands, the Rift Valley of Scotland and the Central Plain of Ireland, which became the centres of Scottish and Irish national life.

South and east of these upland areas lies the **English Lowland**. It occupies three-quarters of England, and contains three-quarters of the population of Great Britain, giving a density of about 900 inhabitants per square mile. It is crossed by low **limestone and chalk uplands**, which retain their height, because their rocks are porous and have allowed water to pass through them, thus escaping erosion. These limestones and chalks alternate with belts of **clay**, which, because they are impervious to water, have been worn down into **vales and basins**. Lowlands and uplands succeed each other from north-west to south-east as follows:

- (1) The **Horse-Shoe Plain** curves round both flanks of the Pennine Arch, rising above 500 feet of altitude in the south in parts of the Midland Plateau. It occupies the bed of an old lake, in which were deposited sheets of rock-salt.
- (2) The **Limestone Ridge** curves across England in the shape of a bow from the Dorset Heights through

the Cotswolds, Edge Hill, the Northampton Uplands, Lincoln Edge, and the North York Moors to the Cleveland Hills. It rises in an escarpment above the Horse-Shoe Plain, and slopes south-eastwards.

- (3) The **Great Vale** stretches for 120 miles from the Mendip Hills to the edge of that sunken part of England which is occupied by the Fens and the Wash.
- (4) The **Chalk Ridge** curves, also bow-shaped, across England from the Western Downs through Salisbury Plain, the White Horse Hills, the Chilterns, the East Anglian Ridge, Norfolk Edge, and the Lincoln Wolds to the Yorkshire Wolds. It rises in an escarpment above the Great Vale, and slopes south-eastward.
- (5) The **Hampshire** and **London Basins** occupy troughs, filled with clays and sands, between the Chalk Ridge and
- (6) The **North** and **South Downs**, also of **chalk**, which radiate eastwards from Salisbury Plain. Their escarpments face inwards towards
- (7) The low upland of the **Weald**.

CLIMATE

The British Isles lie within the region of Maritime Climate of Western Europe (p. 253). The winds of mid-winter are, on an average, five times as strong as in early summer. The influence upon climate of the ocean, which at that season is warm in comparison with the land, is therefore five times more effective in causing warmth and moisture in winter than it is in early summer. In winter, accordingly, isotherms run roughly north and south; and this season in the British Isles is milder than the winter of any other land in the same latitudes (Fig. 78). In summer, when direct sunshine has its effect, heat decreases from the Equator towards the Pole, but the isotherms curve southwards over the Irish and North Seas.

On an average winds blow on half the days in the year from a westerly quarter ; and the general effect of these prevailing westerly winds is to give to the British Isles the warmest and most equable climate which exists in any part of the world between the latitudes of 50° and 60° . On one-fourth of the days in the year winds blow from an easterly quarter, easterly winds being usually cold. Their effect is most felt on the east coast.

Orographical rain is received from this steady flow of moist, warm air from the High Pressure area near the Azores. As the highest land lies in the west, western

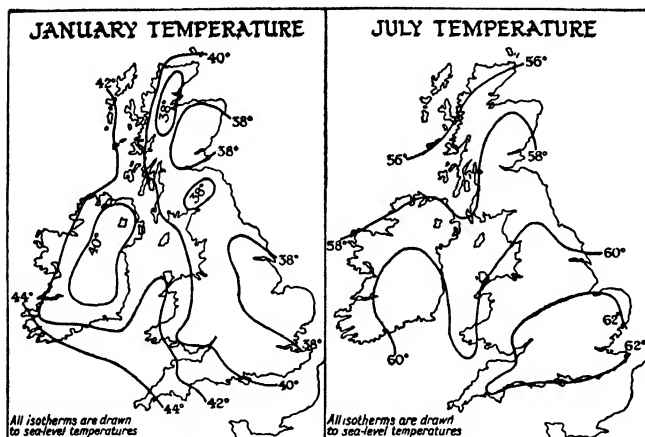


FIG. 78.—British Isles : Temperature.

districts have the heaviest rainfall (Fig. 79). Cyclonic rain is received from the cyclones which travel across the Atlantic from the Icelandic area of Low Pressure. As this Low Pressure area is at its greatest extent and most active during the winter half-year, autumn or winter is as a whole the wettest season over the British Isles, while spring is the driest. In East Anglia, however, July and August are exceptionally wet months, because the heated land surface causes convectional rainfall as thunderstorms. More than half of England, only one-fifteenth of Scotland, and a still smaller fraction of Ireland receive less than 30 inches rainfall in the year.

AGRICULTURAL AND PASTORAL INDUSTRY

This limit of 30 inches rainfall is broadly the line of division between pasture and agriculture. **Pasture** lies to the wetter **west**, where also a comparatively high winter temperature maintains continuous growth of vegetation to support stock. The cultivated area tends to be devoted to

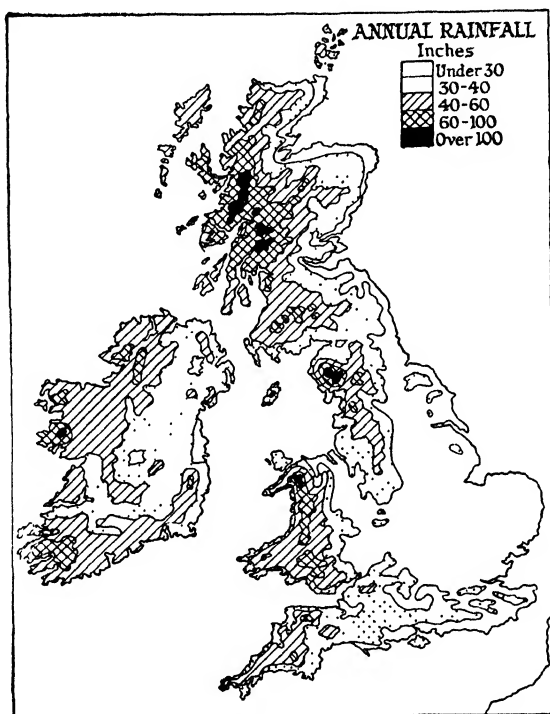


FIG. 79.—British Isles : Rainfall.

fodder crops and cereals suitable as animal foods. Where the soil is formed from very ancient rocks, it is in general too thin and poor for the plough ; in other parts, where it is formed from more recent rocks, it may be very fertile. **Agriculture** dominates in the **east**, where excessive rain in late spring and autumn does not interfere with the preparation of the land and with sowing, and there is dry weather for ripening the grain and harvesting. In Great Britain seven persons in every hundred are engaged in

agricultural and pastoral occupations. In Ireland the proportion is about seventeen per hundred.

Utilisation of the land is shown in Fig. 80. The number

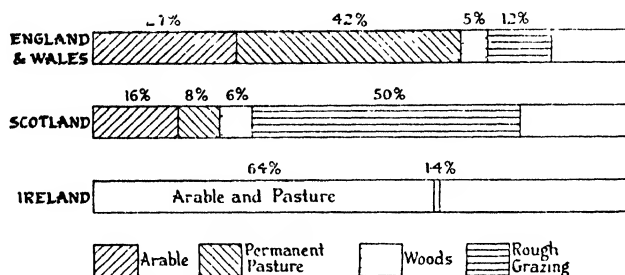


FIG. 80.—British Isles : Utilisation of Land. (Waste Land unshaded.)

of cattle, sheep, and pigs per hundred of the population is as follows :

	Population, 100's omitted	Cattle.	Sheep.	Pigs.
England and Wales	39,946	15	44	7
Scotland . . .	4,842	25	161	3
Ireland . . .	4,228	124	91	33

Relatively to population, Ireland probably breeds more live stock than any other country, except " new " countries like Australia. In England and Wales the chief cattle districts are the south-western peninsulas—Pembroke, Cornwall, Devon, Somerset—and the Horse-Shoe Plain. Sheep, which can live on poorer pasture than cattle, are most densely distributed in the central uplands—Wales, the Southern Uplands of Scotland, and the Cheviots—and on the Downs of Kent.

The chief support of the pastoral industry comes from the demand for **milk** for Great Britain's industrial population, and for the **best qualities of beef and mutton**. The skill of British and Irish stock-breeders, aided perhaps by the climate, produces some of the best breeds of cattle, sheep, and horses in the world ; and in these there is a

large export trade. Almost half of the annual consumption of beef and mutton in Great Britain and Ireland is of home production. Great Britain also produces one-third of the pig products its population consumes.

Dairying and poultry-farming are characteristic developments, as they are generally in the industrialised countries of Western Europe. The special economic function, for example, of the Horse-Shoe Plain is the supply of dairy products to the industrial areas of the Pennine coal-fields, while upon its agricultural raw materials, or to meet the needs of this special market, there have been built up allied industries, such as the manufacture of leather at Leeds and of oilcake at Hull. Even so, this considerable home production of eggs and poultry only meets a little more than half the demand.

About three-quarters of the value of British farm produce sold (apart from what is used on farms) is made up of pastoral products—live stock, dairy produce, eggs and poultry, wool—and only one-quarter of crops. Milk accounts for between 25 and 30 per cent. Of **grain crops**, the cool and moist climate which characterises the greater part of the British Isles makes oats everywhere prevalent on the lower land. The acreage under oats is more than two and a half times greater than that under either wheat or barley, both of which, in varying degrees, require a hot, dry summer. The following figures show the extent to which home-grown wheat enters into the food supply of the British Isles :

Home Crop.	Soviet Union.	Canada.	Australia.	Argentina.	U.S.A.	Other Countries.
13%	21%	20%	17%	15%	8%	6%

Mild winters and a large percentage of bright sunshine enable the Channel Islands and Scilly Islands to supply early vegetables and flowers to the London market. In the cultivation of **fruit**, apples, pears, and plums are not grown, as commercial products, much north of the Trent,

from the risk of damage through late spring frosts. The main cider district is from Devon and Dorset to Hereford and Worcester; Kent specialises in apples and cherries. In the West Midlands the valley of the (Warwickshire) Avon and the Plain of Hereford produce plums; from the eastern counties—the Holland division of Lincolnshire, the Isle of Ely, Cambridgeshire, Norfolk, Suffolk, part of Huntingdonshire—come cooking apples, strawberries, gooseberries, black currants.

The cultivation of **vegetables** and of small fruits, such as strawberries, is carried on largely where there is a good local market, the heavy clay soil of the London Basin being crowded with market-gardens and nursery-gardens. **Hops** are cultivated chiefly in Kent, to a lesser extent in Hereford and Worcester.

Most of the wooded areas in the British Isles are heavy clay land at a considerable elevation, subject to heavy rainfall and low temperatures. To such an extent have the forests that once were widespread been cut down, that Great Britain is now the only industrialised country in the world with so small a proportion as 5 per cent. of its area in forest. Practically all the **timber** used comes from abroad, about four-fifths of the quantity imported being required for mining and house-building purposes, one-fifth for paper manufacture. Only since the Great War has a policy of systematic afforestation been adopted, to provide for the continuance of existing forests and the productive employment of large areas which are better suited for growth of timber than any other product.

FISHERIES

The North Sea is the shallowest of the waters round the British Isles. South of a line joining Peterhead to Jutland it has a depth of less than 100 fathoms, and the numerous banks, of which the Dogger Bank is the largest, that occur in its southern half are covered by still shallower water. Shallow waters also surround the Faroes and Iceland, and fringe the west coast of Europe. All these waters are

worked as fishing grounds, the **North Sea** and **Iceland** being far the most important. In the British and Irish fisheries about 60,000 men and boys are engaged, and fish are landed of over 1,000,000 tons weight. In addition, about the same tonnage is imported. The fishing industry of Britain is the greatest of its kind in the world.

Of the total catch landed at ports in Great Britain, 60 per cent. is **bottom fish** (chiefly haddock, cod, plaice, hake, whiting). Herrings, however, account for approximately 38 per cent. of the whole catch. Broadly speaking, cod and halibut are the most important fishes taken in Icelandic waters; herrings, cod, and haddock in the northern, deeper part of the North Sea. The hake is almost confined to the fishing grounds west of Great Britain; while the plaice has a wide range from the Barentz Sea to south of Ireland.

Of **surface fish**, the mackerel and pilchard are caught only in the Bristol and English Channels; but herrings spawn off different parts of the coast at different seasons—from May, in the Stornoway fisheries, to July and August (Moray Firth ports), July (Grimsby), October (Yarmouth), and December (Devon and Cornwall). The herring fisheries are thus seasonal; and drifters which have been working in the north in the early summer follow the fishing down to Yarmouth in the autumn, where also come Scots fisher-girls to prepare the catch for pickling and curing.

Herrings are taken chiefly for curing and for export. Quite small towns with inferior rail communications can, therefore, land great quantities of herrings; and mainly northern ports predominate in this fishery—Yarmouth, Lowestoft, Fraserburgh, Wick, Peterhead, Stornoway, Stronsay (Orkney), North Shields. Most of the bottom fish, on the other hand, are caught for the home market, and larger vessels engage throughout the year in these fisheries. Larger ports and good railway communications are, therefore, essential; and Grimsby, Hull, Aberdeen, Fleetwood, Milford, Billingsgate (London), Leith handle the largest quantities.

The chief oyster grounds are at Whitstable (Kent) and near Colchester ; lobsters come from the rocky coasts of south-west England, and shrimps from the Wash. Salmon are taken by rod and net in the rivers and estuaries of Scotland and Ireland.

CENTRES OF INDUSTRY AND POPULATION

Those branches of industry so far considered decide the distribution of the rural population. But in England and Wales only one-fifth, in Scotland a not much larger proportion of the population, is classified as "rural" ; and quite a different set of factors determines the distribution of the "urban" population in great or small towns. The minerals of Britain, above all its coal and the iron found close to it, and their nearness to the sea, enabled her to become the first industrialised state.

The outstanding features of the **Industrial Revolution** were : (1) the use of mechanical power, based upon coal ; (2) the growth of the factory system, and hence of town populations ; (3) a revolution in transport, leading to the concentration of overseas shipping on a few great ports ; and (4) the localisation of industries in areas specially favourable to production on a large scale. London kept and increased its old predominance ; but throughout the rest of England **population** and **industry shifted** at first from the south and east **to the north**—to the coal-fields. With the exception of the Kentish coal-field, mining districts are all north of a line drawn across England from Lyme Regis in Dorset to the Humber.

To-day, however, foreign goods undersell British goods in many overseas markets ; and this has caused a decline in those industries which supplied the bulk of British exports—the textile industries, all branches of iron and steel manufacture, and coal. Electric power also can now be brought cheaply to the factory, instead of the factory having to be situated near the coal-fields. As a result, **new industries**, such as artificial silk manufacture, the construction of motor-cars, electrical engineering, tend to

become established **in the south** of England, attracted in part by the large market available in London. These industries manufacture chiefly for home consumption, and are relatively indifferent to facilities for export.

Half the world tonnage of **merchant shipping** launched annually is built in the United Kingdom, about one-fourth

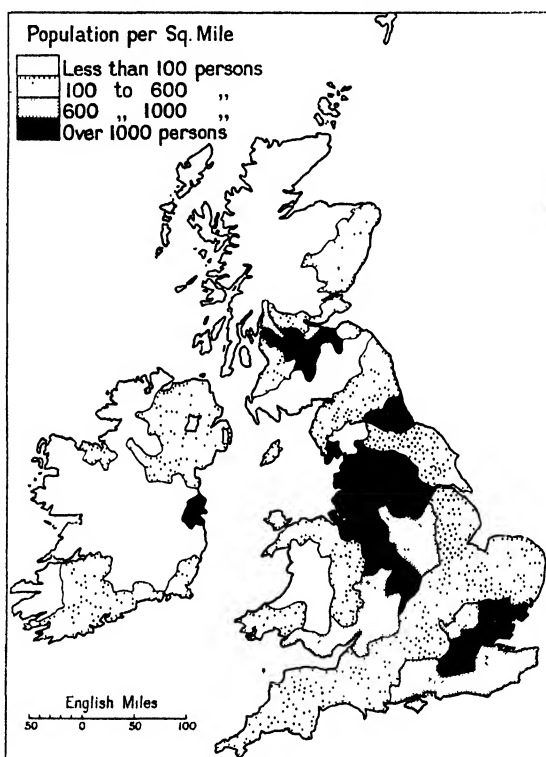


FIG. 81.—Population of the British Isles.

of this shipping being constructed in the yards of the Clyde, one-fourth on the lower reaches of three Northumbrian rivers—Tyne, Wear, and Tees—and one-twentieth on the Lagan, near Belfast.

For the relatively small area of the British Isles there are **ten great commercial harbours**, whose trade reflects especially the textile and hardware industries, both of which have experienced the localisation typical of the

Industrial Revolution. These harbours represent parallel belts of hinterland, lying from south-east to north-west, which decrease in fertility of soil and ease of access to the Old World, but increase in mineral wealth and ease of access to the New World.

On the continental margin of the agricultural belt the Basins of London and Hampshire contain the two oldest English ports of **London** and **Southampton**. So huge and widespread are the trade connections of London that vessels are constantly sailing for all parts of the world. The trade of London has thus become to a considerable extent "entrepôt" trade; that is, foreign and colonial goods, such as tea, wool, and rubber, are handled there, without undergoing any process of manufacture, but with a profit added in course of re-export to other markets. Other goods, again, are transhipped at London without the addition of any profit to the price at which they are charged. Such "re-exports" (including both entrepôt and transhipped goods) make up about 13 per cent. of British exports.

On the inner margin of the agricultural belt **Bristol** and **Hull** are outlets for the two most important river-basins of England (Severn and Ouse-Trent) draining the Horse-Shoe Plain. Behind the agricultural belt the coal-fields have ports on either side of Britain, at **Cardiff** and the **Tyne**. The textile industries have their ports on the west coast at **Liverpool** and **Manchester**, with Bristol subsidiary, and on the east coast at Hull. Lastly, on the northern margin of the Irish Sea, and thus nearer to America, **Glasgow** and **Belfast** serve the industries and agriculture of the Rift Valley of Scotland and of the Ulster Basin in Northern Ireland.

COMMERCE OF THE UNITED KINGDOM

The trade of the United Kingdom, per head of the population, is greater than that of any other country in the world. The home production of food, as we have seen, is insufficient to feed the population, which in England

has a density of 742 persons per square mile, in Wales 289, in Scotland 159, and in Northern Ireland 239. In addition to food imports, raw materials are brought from overseas for manufacture. Payment for these imports is made chiefly by the sale abroad of manufactured goods and coal. The export trade in coal has the advantage of cheap freights (p. 65). Even so, the total value of imports exceeds that of exports; and the difference is made up by what are termed "invisible exports," being chiefly monies paid for the services of British shipping, and as interest on British money invested abroad.

Imports consist of 46 per cent. food, drink, and tobacco, 24 per cent. raw materials, and 30 per cent. manufactured articles. The largest imports are those of meat, grain and flour, raw wool, raw cotton, timber, oils and fats. Exports of British produce consist of 9 per cent. food, drink, and tobacco, 11 per cent. raw materials, 77 per cent. manufactured articles, and 3 per cent. goods sent by parcel post. The largest exports are cotton yarns and manufactures, iron and steel manufactures, vehicles (including ships and aircraft), machinery, coal, woollen and worsted yarns and manufactures.

The countries of the British Empire (including the Irish Free State) furnish 29 per cent. of the total imports, and form the markets for $43\frac{1}{2}$ per cent. of the exports of British produce. The largest contributors to the imports are the United States, Germany, Argentina, Denmark, and India; the largest export markets are India, the Irish Free State, Australia, France, the United States, and Canada (see Fig. 12).

EXERCISES I

A

1. State briefly the advantages Britain derives from her position in the shallow seas of the Continental Shelf.
2. What advantages do the British Isles obtain from being the centre of the land masses of the globe?
3. To what mountainous type do these hill-groups belong (*i.e.* Hercynian, limestone, etc.): Southern Uplands, Pennine

Arch, Grampians, Lincoln Wolds, Yorkshire Wolds, East Anglian Ridge, Cuillins, Mourne Mountains, Cotswolds, Downs ?

4. Say in what part of the British Isles and at what season of the year rainfall is (a) orographical, (b) cyclonic, (c) convectional. Which are the driest months in the British Isles ?
5. Explain : afforestation, "entrepôt" trade, "invisible" exports.
6. Make a copy of Fig. 76 in your map book.
7. Name some well-known breeds of cattle, their "home" districts, and their characteristics.
8. Name counties or districts where these are found in large numbers : pigs, sheep, dairy cattle, poultry.
9. Explain the difference between a drifter and a trawler. Name towns along the coast of Great Britain engaged in the herring industry.
10. Where does London obtain its huge milk supply ? What conditions are necessary to secure a rapid and reliable supply ?
11. Why has Essex an average of 200 days in the year without rain, while the north-west of Scotland has only 100 ?
12. Insert and name on a blank map of Great Britain and Ireland the twenty-three cities which contain over 200,000 inhabitants. Show cities over 1,000,000 inhabitants by a black square, those from 500,000 to 1,000,000 by a black dot, and those under 500,000 by a circle.
13. Shade or colour an outline map of the British Isles to show less than 30, 30-40, over 40 inches rainfall, and write in their appropriate places the words—wheat, sheep, dairying, turnips, potatoes, fruit, water reservoirs, water-power.

B

1. Compare the exports and imports of Great Britain with those of India, the United States, Argentina, and Germany, and state the characteristics which mark the trade of an industrial country.
2. Which are the principal overseas sources of the supply to Great Britain of : beef, mutton, wheat, dairy produce, cocoa, cotton, tea, wool, jute, rubber, iron, oil, timber ?
3. Find out from the sections of this book dealing with Canada, West Africa, South Africa, Australia, New Zealand, India, Ceylon, what proportion of their trade is with Great Britain, and make a list of their exports.

SCOTLAND

REGIONS OF SCOTLAND

Scotland has an area of 30,405 square miles and a population of 4,842,000. It falls structurally and economically into three regions (Fig. 84) :

Non-Industrial : (1) The Metamorphic Plateau, divided by Glenmore Rift into (a) Northern Highlands, (b) Grampian Highlands.

(2) The Southern Uplands.

Industrial : (3) The Central or Rift Valley.

In each there is a contrast, based upon climate, between east and west.

(1) THE HIGHLANDS

The Scottish Highland region includes the Metamorphic Plateau, of greater average elevation than the rest of the country, and the belt of lowland that fringes the east coast from Stonehaven to Dornoch Firth, and recurs in the Plain of Caithness and the Orkney Islands. Apart from this lowland rim the Highlands are a region of natural poverty. Their hard rocks give only a thin soil which is kept wet by the heavy rainfall (Fig. 79) ; the temperature is lowered by evaporation of the surface water ; and the glaciers of the Ice Age have stripped off the soil formed previous to that epoch, and deepened the valleys, rendering their slopes steeper and less suitable for agriculture.

Almost the only minerals they contain are granite in Aberdeenshire and slates at Ballachulish in Argyll. The deep valleys, with their narrow lochs and heavy rainfall, offer the possibility (which is partially being realised) of developing hydro-electric power ; but, as the Highland rocks are so poor in minerals, such power can be used industrially chiefly outside the Highland region. Aluminium-refining at Kinlochleven is an instance of its

local use. Whisky-distilling, based originally upon locally grown barley, is also relatively important at several centres, peat being used in curing the malt and giving a distinctive flavour to the spirits.

In the past, when people were satisfied with less comfort, the Highlands supported a larger rural population than they do to-day. But the typical Highland settlement, the crofting village, where each holding provides its occupants with food, fire, and clothing, offers a hard-won, scanty living, apt to encourage emigration as an alternative. The most valuable export of the Highlands has long been men.

The heavier rainfall of the west has carved mountains and valleys from the plateau in bolder outlines than in the east ; and a constantly moist, mild, and cloudy atmosphere has produced there an essentially pastoral vegetation, varying from peat bogs (which supply fuel) and wet moors on the lower ground to dry grass moors on the upper slopes. Apart from afforestation, the **West Highlands** are fit for little save pastoral industries ; and these have largely taken the form of preserving grouse and deer for sport.

The vegetation of the **East Highlands**, with their more extreme climate and drier atmosphere, is rather one of heather. Valleys are wider, giving more and better land for cultivation ; villages, and even towns, are more numerous and prosperous. To a greater degree than in the west, conditions favour afforestation and development of a tourist or hotel industry, using the open spaces of the North as the " lungs " of the industrial Rift Valley.

The Grampian water-parting from Ben Nevis to Ben Macdhui and the other summits of the Cairngorms (which rise to heights of more than 4000 feet), and the water-parting of the Northern Highlands, which diverges also from Ben Nevis (Fig. 77), and culminates in Mam Soul, Ben Dearg, Ben Wyvis, and other summits over 3000 feet, enclose the drainage area of the **Moray Basin** (Fig. 84). This Basin contains fourteen of the twenty-two burghs in the Highlands, with a population over 2000. The soils

round the Moray Firth, being derived from Old Red Sandstone rocks (Fig. 77), are in places very fertile. Rainfall is exceptionally low on the coast, which is a "rain-shadow," and the air currents from the Atlantic sweep down the leeward slopes of the ridges as warm and dry Föhn-like winds.

In the angle of the coast-line, where all routes from the south must converge to pass north or westward, lies **Inverness** (22,000); while eastwards and northwards the coastal lowland has market towns like Elgin and Dingwall, tourist centres like Nairn, and fishing ports like Fraserburgh and Buckie. **Aberdeen** (167,000), the intellectual centre of the north-east, owes its importance to its situation on the margin of good farming land just north of the gap between the "Highland edge" and the sea, to its prominence as a fishing port, and to its granite-polishing industry, using raw material partly imported, partly quarried locally or at Peterhead, another fishing port.

Except for the eastern coast plain and for Glenmore, which is relatively unimportant because it connects two regions with similar products, the main **lines of communication** in the Highlands depend upon the rivers. The Spey flows "longitudinally," that is, in the same direction as the former mountain ridges (p. 321), from south-west to north-east. The Garry-Tummel-Tay valley is "transverse," that is, it cuts across this south-west to north-east "graining" of the rocks. Together these two valleys supply a route for the main railway from Perth by the Pass of Drumochter to Inverness. The longitudinal valley of the Spey, however, is continued westwards by Loch Laggan and the Spean, for the Spean has "captured" the original headwaters of the Spey; and the Garry-Tummel-Tay has a longitudinal tributary, the Dochart-Tay, the upper valley of which is prolonged by Glen Falloch to the head of Loch Lomond. These longitudinal valleys are utilised in part by railway routes from Callander to Oban, and from Glasgow to Fort William and Mallaig.

(2) THE SOUTHERN UPLANDS

The Highlands are relatively inaccessible from the Rift Valley, because, owing to the south-west to north-east graining of the rocks, all rivers which reach the Rift Valley must cut their way through gorges, as the Garry-Tay does at Killiecrankie and the Birnam defile. In contrast, the Southern Uplands are completely broken by the valleys of the Nith and the Tweed.

In relief, the Uplands resemble the Eastern Highlands rather than the Western, narrow valley-lakes being, with a few exceptions, absent, and the hill masses being generally of the lumpy type of the Cairngorms. Heavier rainfall, however, and the presence of granite rocks round Loch Dee, at Cairnsmore of Fleet and at Criffel, have sculptured the Galloway Highlands, west of the Nith, more boldly than the rounded outlines and flat-topped summits of the Eastern Uplands. Above the plain of East Lothian the Lammermuirs and Moorfoots, broken by the Gala tributary of the Tweed, plainly mark the northern face of the Uplands; on the south the Teviot skirts the northern foot of the Cheviots, with whose water-parting the boundary between Scotland and England coincides.

Population is nearly one and a half times as dense in the Uplands as in the Highlands. Economically there is again a contrast between west and east. The eastern area is the Tweed Basin, the western is Galloway and "the Dales" (Nithsdale, Annandale, Eskdale, and Liddesdale), which offer routes for road and railway between Carlisle and the Rift Valley.

(a) **Galloway** is exposed on the west and south to sea influences. These bring a mild climate to the coastal districts, allowing cattle to remain in the fields the whole year round. On the other hand, cereal cultivation is handicapped by heavy rainfall and cloudiness. Thus, good markets being adjacent for dairy produce, Galloway specialises agriculturally in dairying and sheep-farming. In the **Dales** agriculture is half of the type of Galloway,

half of the Tweeddale type. Arable mixed farming predominates on the Solway plain; sheep-raising is more important in the hill districts. The principal centres are market towns, linked up by the railway from Lockerbie by **Dumfries** (22,000) to **Stranraer**, from which there is a short sea passage to Larne for Belfast. The waters of the Ken and Dee are utilised by hydro-electric generating stations for the transmission of electric light and power throughout southern Scotland, in conjunction with other power stations, which generate electric power from coal.

(b) The lower Tweed valley and that of the Teviot up to Hawick form the eastward-facing lowland of **Tweeddale** (Fig. 84), encircled by the bare hills of the watershed. Like the coast-lands of the Moray Basin, this lowland (the old district of the Merse, or March) is relatively warm and dry, for the Atlantic winds reach it with Föhn effect across the watershed. Its natural resources are made use of to-day in the same ways as before the War of Independence, when Tweeddale was the wealthiest district of Scotland. Sheep still graze the hills, and there is arable farming in the lowland. The chief differences are that trade now passes north and south by road and rail instead of eastwards to Berwick, and that a textile industry has been developed in **Hawick** (17,000), **Galashiels** (13,000), Selkirk, Peebles, and Jedburgh. This Border woollen industry was started with the advantages of local wool supply and local water-power. Distance from the coal-fields has compelled it to specialise in fine quality "tweeds," for which chiefly Australian wool is used. The coarser wool of the local "blackfaced" sheep goes south to Yorkshire.

(3) THE RIFT VALLEY

The Rift Valley is a trough about 50 miles wide, floored by rocks that are younger and softer than those of the Highlands. These give to the valley the agricultural and mineral resources which have made it the most densely populated region of Scotland (Fig. 81). It is not a com-

pletely "lowland" region; for intense volcanic activity has poured out sheets of lava which remain (1) parallel to the "Highland edge" as the Sidlaws, Ochils, Campsies, Kilpatrick, and Renfrew Hills, and (2) as a second line, which lies nearly at right angles to the first, and forms the watershed between Upper Clydesdale and the Firth of Clyde (Fig. 82). Farther east the Pentland ridge of volcanic and older rocks runs parallel to the Glenmore Rift; and the sites of numerous volcanic "vents" (openings) are marked by isolated crags, such as are occupied by the castles of Edinburgh, Stirling, and Dumbarton.

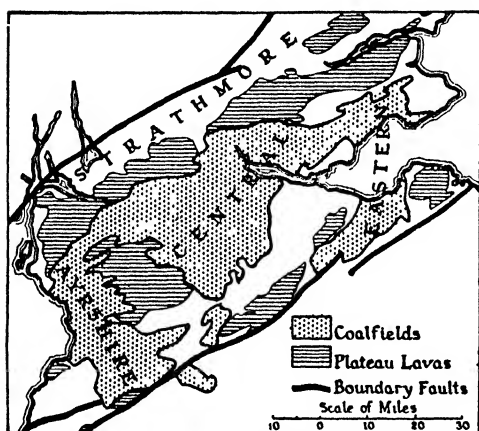


FIG. 82.—Scottish Coal-fields.

army, of southern Scotland. The breach between the Kilpatrick and Renfrew Hills at **Dumbarton** (21,000) is occupied, not by a Highland river, but by the Clyde flowing north-westwards.

Agriculturally there is a contrast between east and west. Broadly speaking, the heavier rainfall and the great demand for milk from the industrialised population of Clydesdale make the **west pastoral**, while **arable** farming predominates in the **east**. A high standard of mixed farming is met with in the Lothians, Fife, the Carse of Gowrie, and north of the Sidlaws on the Old Red Sandstone soils of Strathmore. Potatoes are probably the most notable

The northern line of volcanic hills is breached between the Sidlaws and Ochils by the Tay at **Perth** (34,000), and between the Ochils and Campsies by the Teith-Forth at **Stirling** (22,000), which, commanding the lowest ford on the Forth, was the key, to an English invader, of the North, and, to a Highland

product of East Lothian, beans in the Carse of Gowrie, the "Angus" breed of cattle in Strathmore, and raspberries (for jam manufacture) at Carluke in Middle Clydesdale and Blairgowrie in the Carse of Gowrie.

Strathmore. In Strathmore, if we apply the name to the whole corridor across Scotland between the Sidlaws-Campsies and the "Highland edge," urban centres are distributed in three rows along the corridor, the outermost being a series of fault-line villages from Stonehaven to Rothesay, situated where Highland glens open on to the Rift Valley. To some of these the development of railway communications has brought prosperity as tourist centres (*e.g.* Crieff, Callander). Along the middle of the corridor stands the second row, of agricultural market-towns, each served by a good local road-system, and each a railway junction. The most considerable of these, **Forfar** and **Brechin**, have become connected industrially with Dundee. The third row consists of **Montrose**, a fishing centre, at the seaward end of the Sidlaws-Ochils, and the three "gap-towns" of Perth, Stirling, and Dumbarton.

THE SCOTTISH COAL-FIELDS

South of this line of volcanic hills the distribution of population is dependent chiefly upon the coal-fields and their associated manufactures. Coal occurs in three main basins—(a) the **Central Basin**, which includes the coal-fields of Lanark, Dumbarton, Stirling, and Clackmannan; (b) the **Eastern Basin** (Lothians-Fife); and (c) the **Ayrshire Basin**. Their characteristics are: (1) **Easy access to the sea**; (2) **Supplies of iron ore**, interbedded with the coal. The "waist" of Scotland between the Firths of Clyde and Forth is only 30 miles across. Thus the modern industries of the Central coal-field have ports near the heads of both Clyde and Forth, at Glasgow and at Grangemouth. The Firth of Tay also penetrates deeply into the Rift Valley. Although the iron ore is now practically worked out, its presence gave a start to the Scottish metal industries. The Central Field is the most important,

mining more than half the Scottish coal output. The Eastern field supplies nearly half the coal export. Both production and shipment of Scottish coal are 14 per cent. of the total figures for Great Britain.

(a) **The Central Basin.** Lanarkshire contains nearly one-third of the population of Scotland. This great industrial area centres round **Glasgow** (1,088,000), which is situated on the Clyde where that river cuts the narrow, well-defined valley that extends south of the line of the Ochils-Campsies from the lowlands of the Firth of Forth through the Beith Gap to the Ayrshire coast. Through this valley was built the Forth and Clyde Canal, completed in 1790, and the first railway system in Scotland, from Ayr to Edinburgh. Through Grangemouth on the Forth, Lanarkshire can obtain from Scandinavia timber for pit props, wood-pulp for paper-making, and iron ore, and can export to Europe its more bulky products—coal and coke, metal manufactures, and machinery.

When the Union of 1707 threw open the American plantations to Scottish commerce, Glasgow commenced a trade in tobacco which soon supplied half the markets of Europe, the shallow, winding Clyde being deepened to carry vessels to the city's quays. The revolt of the American colonies diverted attention from tobacco to the sugar of the West Indies, and laid the foundations of sugar refining at **Greenock** (78,900). It caused also the foundation of a **cotton** industry at **Paisley** (86,000) and of iron industries, when the hot-blast process made it possible to use the "blackband" ores of Lanarkshire.

Two-fifths of the industrial workers of Glasgow are engaged in the **metal industries**. Towns and villages sprang up on the coal-field as the railways spread southwards to the neighbourhood of **Hamilton** (37,000). Blast furnaces were erected round **Coatbridge** (43,000—iron-works), **Motherwell and Wishaw** (64,000—constructional steelworks), and **Falkirk** (36,000—iron foundries). The inventions of Watt and Bell stimulated shipbuilding, which expanded down-firth to **Govan, Port-Glasgow,**

Dumbarton, and Greenock, and created a new city at **Clydebank** (46,900). Coal, iron, steel, and machinery are Glasgow's main exports; grain and flour are leading imports.

(b) **The Eastern Basin.** **Edinburgh** (438,900), the Scottish capital, originated as a fortress, guarding, with Haddington and Linlithgow, the east coastal route by Dunbar from England. From the Castle on its volcanic "crag" the city spread eastwards down the sloping "tail" of boulder-clay in the gap, 6 miles wide, between the Pentlands and the sea. Edinburgh is the second largest city in Scotland, partly because of its importance as an administrative and educational centre, partly because of the cheap power available for industry in the Lothians coal-field. Two-thirds of its workers are employed in engineering, printing, milling, and the making of clothing, paper, and beverages. Brewing is connected with the barley fields of the Lothians and with the excellent water obtainable. **Leith**, the harbour of Edinburgh, is the second Scottish port, though with a trade only about one-third that of Glasgow. It exports to the North Sea and Baltic countries coal, machinery, textile, leather, and metal manufactures, and imports Baltic timber, raw materials for the textile, paper-making, and other industries, American grain, dairy produce, and groceries, for distribution throughout the Rift Valley, eastern Scotland, and northern England.

The old trading and salt-manufacturing towns, that fringe the Lothian coast, have also developed local industries, with power drawn from the Lothians coal-field. Farther east, the seaside golf links of Gullane, North Berwick, and Dunbar are residential and holiday centres.

The Scottish shale oil industry, for the extraction of petroleum from oil shales, is carried on between the Firth of Forth and the Pentlands about 12 miles west of Edinburgh, but is at present in a depressed condition.

Fife occupied a half-isolated position between the Firths of Tay and Forth and the Ochils until the bridging of the two firths for railways on the through route between Edin-

burgh and Aberdeen. Fishing, the "hotel" industry, and, at St. Andrews, education, support the girdle of ancient burghs round its coast. In the south-west, Methil and Burntisland have developed as ports for the Fife coal-field, and **Kirkcaldy** (43,000) utilises local coal for the leading linoleum industry in Britain, derived from an older manufacture of linen, which **Dunfermline** (34,900) still retains. Half the goods shipped from all the ports of the Firth of Forth are coal and coke; half the imports are butter, eggs, wheat, sugar, and other commodities of food and drink for human consumption.

Beyond the limits of the Eastern coal-field, the Forfarshire coastland centres upon the third Scottish city, **Dundee** (175,000). Its seaboard position and the experience gained in an early manufacture of coarse linen from home-grown flax have been utilised to create a factory industry in **jute**, in spite of the remoteness of its site from sources of both power and raw material. Other industries have also developed; and some of these have spread to Arbroath, Montrose, Forfar, and Brechin. Broughty Ferry and Carnoustie are local holiday resorts on the coast.

(c) **The Ayrshire Basin.** Ayrshire, like Fife, was formerly relatively isolated by the hills which form its eastern watershed. Like Fife, it has developed industrially. But the bulk of the Ayrshire coal has been either baked or buried by volcanic action, so that mining is possible only in scattered localities. Towns of medium size are accordingly rare. The two ancient cities of **Ayr** (36,000) and **Kilmarnock** (38,000) are both near workable areas of the coal-field, and with imported iron ore have developed railway and machine works. The former is situated midway on the curving coast-line, with routes radiating outwards to the hill passes; the latter is a woollen-manufacturing town (carpets). Nearly half the Ayrshire coal output is exported, largely to Ireland, from Ayr, Ardrossan, Troon, and Irvine.

EXERCISES II

A

1. On a blank map of Scotland mark and name :
 - (a) Moray Firth, Firth of Clyde, Firth of Forth ; Arran, Skye, Mull, Lewis, Iona.
 - (b) The rivers : Garry-Tummel-Tay, Forth-Teith, Tweed-Teviot, Clyde.
 - (c) Lochs Katrine, Lomond, Maree, Leven.
 - (d) Ben Nevis, Ben Wyvis, Ben Attow, Pentland Hills, Ochils, Sidlaws, Southern Uplands.
2. On a blank map insert :
 - (a) The capital and the largest town in Scotland.
 - (b) Five towns in the Highlands, five in the Uplands, five in the Rift Valley.
 - (c) The route of the L.M.S. Railway from (i) Carlisle to Stirling, (ii) Carlisle to Glasgow, (iii) Carlisle to Edinburgh, (iv) Glasgow to Aberdeen.
 - (d) The L.N.E.R. route from (i) Berwick to Aberdeen, (ii) Edinburgh to Inverness, (iii) Glasgow to Fort William-Mallaig.
3. Name one town in Scotland where these are engaged in : ship-building, brewing, jute manufacture, linen manufacture, linoleum manufacture, sugar-refining, export of coal, import of pit props, carpet-making, iron goods manufacture, worsteds, paper.
4. Name the chief (a) fruit-growing areas, (b) dairy-farming areas, (c) tweed manufacturing areas or towns, (d) fishing centres on the east coast, (e) university cities.
5. (a) Where in Scotland do we find rocks showing recent volcanic disturbance ? (b) How was the Metamorphic Plateau formed ? Where else in the British Isles is it to be found ?
6. What differences exist between the West and the East Highlands in respect of (a) climate, (b) vegetation ?
7. In what parts of Scotland is the population (a) dense, (b) moderate, (c) scanty ? Give reasons for the distribution.
8. Explain the selection of the sites of the castles of Edinburgh, Stirling, Dumbarton.
9. Explain why there are so many Lakes in Scotland. Are they in any way connected with the wealth of Scotland ?
10. Explain why the west coast of Scotland is so rugged. Why does the west coast of England not show the same characteristics ?

B

1. Name the natural divisions of Scotland, and give a detailed description of one of them.

2. Where are the Old Red Sandstone districts of Scotland, and for what is each important ?
3. How do you account for the drier and warmer climates of the Moray Basin and Tweeddale compared with that of the west coasts ?
4. Write notes on the following districts : Galloway, Tweeddale, Fife, Strathmore, Carse of Gowrie, West Highlands.
5. Explain the geographical factors which have given importance to the following towns : Inverness, Aberdeen, Perth, Dundee, Stirling, Berwick, Edinburgh, Glasgow, Dumfries, Dunbar.
6. Draw a sketch map showing the chief industrial areas of Scotland, indicating where they obtain their sources of power.
7. What is meant by " localisation " of industry ? Illustrate your answer by an account of the metal industry of Clydeside, and either the Scottish woollen or jute industry.

IRELAND

IRELAND : CLIMATE, AGRICULTURE, MINERALS

Ireland is rather larger than Scotland. Its six north-eastern counties constitute **Northern Ireland**, which is part of the United Kingdom of Great Britain and Ireland. The rest of Ireland is the **Irish Free State**—a Dominion of the British Commonwealth. Their respective areas are 5200 and 26,600 square miles ; their respective populations are 1,256,000 and 2,971,000. The chief exports of the Irish Free State are—live cattle and dairy produce, 41½ per cent. ; pigs, pork, and bacon, 12½ per cent. ; porter, beer, and ale, 12 per cent. ; poultry and eggs, 8 per cent.

As Ireland is the outpost of Eurasia towards the west, Atlantic influences dominate its climate. The westerly winds arrive warm and moist after passage over hundreds of miles of water. On the north-east coast, however, north winds are frequent, bringing sudden temperature changes as far south as Kildare. There is an abundant rainfall, partly cyclonic, partly orographical ; for the winds have to rise quickly to cross the western mountains. For this reason the south-west and west are the wettest regions, and the driest is the east (Fig. 79). The climate

of Ireland is thus typically mild and moist. Nowhere is a cold spell of long duration ; all districts experience a mild or warm summer. But the north-east, being relatively drier, and also, in winter, colder than the rest of the island, has much more invigorating climatic conditions than the south-western counties.

The abundant rainfall and mild winter give grasses and other moisture-loving plants a long period of growth in this "Emerald Isle." On the other hand, the heavy drainage tends, in some parts, to wash away fertilising matter from the soil, and the average summer temperature (2° lower than in England) makes late and uncertain the ripening of grain and fruit. Therefore only about a quarter of Ireland is arable land, against half under some sort of pasture (p. 326), and her chief industry is dairy-farming on the rich grasslands, aided by central creameries and bacon factories controlled by co-operative societies. At a period in the past when heavier rainfall prevailed, very extensive peat-bogs developed. On the upland areas these are drying ; where less exposed to wind they afford a fuel which can be cut when labour is not otherwise employed.

Generally throughout Ireland the coal-bearing rocks have been removed by denudation. The island thus possesses little workable coal, the two main fields being those of Castlecomer (Co. Kilkenny) and Tyrone. Marble is quarried in the Metamorphic Plateau (Connemara).

Ireland consists of three regions (Fig. 84). These are Uplands in the South and North, and between them a Central Plain.

(a) **THE CENTRAL PLAIN**

The Central Plain stretches across the island from the Dublin Gate to Galway Bay. From it broad corridors of lowland extend northwards and southwards ; and by a dozen gaps between the uplands the Plain reaches the sea. It is floored throughout by rocks of limestone (Fig. 77), generally concealed by boulder-clay or peat. The ease with which limestone is soluble in water is the cause of its

numerous shallow lakes (loughs). Nearly half the course of the Erne is through such lakes ; and the Shannon, the longest river in the British Isles, has a similar course above Athlone. This position where the broad Shannon enters its lake-free course has made **Athlone** an important crossing-place since ancient times. East of the Shannon the extent of bogland still gives importance to gap-towns, such as Tullamore, in the Bog of Allen, where gravel ridges left by glaciers give means of passage through the bogs.

On a front of 50 miles the Central Plain reaches the Irish Sea in the Dublin Gate, facing the Midland Gate of England. Through this open door wave after wave of invaders has entered the Plain. At the southern end of this lowland coast is its most convenient harbour of Dublin Bay. Here a settlement at the lowest ford on the Liffey became a stronghold, first of the Norsemen, later of the Anglo-Normans. From this gateway of Ireland railways radiate across the Plain, and there is also connection by canal with the Shannon. Across the Irish Sea Holyhead is distant only 70 miles, and London 350 miles. **Dublin** (405,000) is thus centrally placed as capital of the Irish Free State and as a collecting centre (and distributor to Great Britain) for the produce of the eastern Central Plain. It has brewing, distilling, and poplin manufacturing industries. Dun Laoghaire is its port, Drogheda, on the Boyne, and Dundalk being other ports of the Dublin Gate, with linen manufactures.

(b) THE UPLANDS OF THE SOUTH

The Uplands of the South have two divisions—in the west the Hercynian Uplands, in the east the Leinster Chain.

(1) **The Hercynian Uplands.** West of the Comeragh Mountains (Fig. 83) ridges and valleys cross Ireland from west to east. Farther north, in Slieve Bloom and Slieve Felim, they take a north-easterly direction. Between the south-western end of Slieve Felim and the Galtee

mountains is the Golden Vale. Its renowned fertility is due to its rich soil and to a moderate rainfall; for it lies within the dry belt (Fig. 79), which crosses southern Ireland. Within this belt there is a steady increase in the proportion of land under the plough from Kerry to Wexford. The lowland corridor from Waterford to Limerick by the Golden Vale is cut at Cashel and Clonmel by two corridors from the Central Plain, on either side of the Castlecomer Plateau and Slieve Ardagh.

The Bandon, Lee, and Blackwater rivers flow eastwards through three valleys between the west-east ridges. These

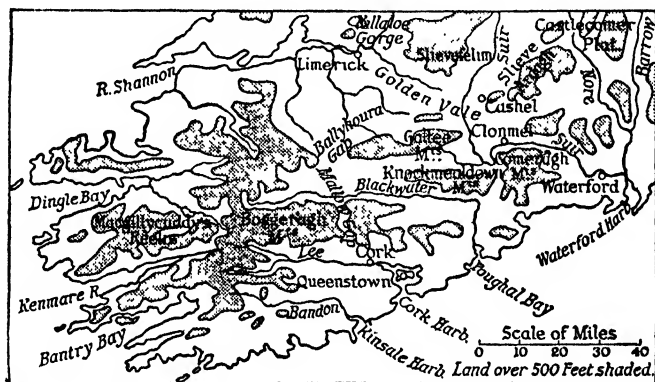


FIG. 83.—South-Western Ireland.

valleys terminate in the west in the rias of Bantry, Kenmare, and Dingle Bays. These are separated by mountainous peninsulas, which contain some of Ireland's loftiest peaks (Carrantuohill, in the Macgillicuddy's Reeks, 3400 feet). The chief entrance to this district from the plain is by way of the Ballyhoura and Mallow Gaps in the west-east ridges. These lead southwards to **Cork** (78,500), the third city of Ireland, with dairying industries and exports, and a splendid island port at Queenstown (Cobh), on Cork Harbour inlet, which is a place of call for Atlantic liners. Farther east cultivation of barley round the sheltered anchorage of **Waterford** (26,600) has resulted in a brewing industry.

North of the west-east Hercynian ridges lies the estuary of the Shannon. **Limerick** (39,500), at the head of the

estuary, is the chief port of the western seaboard. It exports cattle and dairy produce, and has bacon-curing and tanning industries. The 100-feet fall of the Shannon through the Killaloe gorge between Lough Derg and the sea is utilised, by barrage, sluices, and power-station, to transmit electricity for light and power over the Irish Free State.

(2) **The Leinster Chain.** East of this district of ridges and valleys the huge granite arch of the Leinster Chain for 80 miles between Dublin and the lower Barrow shuts off the interior of Ireland from the coast. As the general direction of the Chain is from south-west to north-east, the coastal lowland is broadest in the south, where **Wexford** stands on the wide but shallow estuary of the Slaney. The outport of Wexford is Rosslare, which has fast steamship connection across St. George's Channel with Fishguard in Pembroke.

(c) **THE UPLANDS OF THE NORTH**

The north and north-west of Ireland are broadly divided into two districts of very different character: (1) The Metamorphic Plateau, and (2) the Ulster Basin.

(1) **The Metamorphic Plateau.** This is a typical highland area, generally similar in the nature of its rocks and soil, as in its heavy rainfall, vegetation, and economic resources, to the West Highlands of Scotland. It contains the Sperrin mountains and the mountains of Donegal, Mayo, and Connemara, which include Ben Bulbin, the Ox mountains, Nephin Beg, and the Twelve Pins. Between the Donegal and Sperrin mountains it is cut by the valley of the Foyle, opening on the wide inlet of Lough Foyle, where Moville has become a calling-station for Canadian liners. The densest population in the Metamorphic area is settled here between the route-centre of Strabane and the head of Lough Foyle. **Londonderry** (45,000), at the head of Lough Foyle, has shipbuilding and linen industries.

(2) **The Ulster Basin.** The high moors of the Sperrin mountains descend abruptly on the east to the lowland of

the Ulster Basin, which is a wide depression, partly occupied by Lough Neagh, the largest lake in the British Isles. South of Lough Neagh, where the lowland is widest, are Armagh and Portadown, respectively an ecclesiastical capital and a railway centre. Uplands encircle the Basin between which lie four lowland corridors : (1) northwards by the valley of the Bann River, which flows from Lough Neagh to the Atlantic ; (2) south-westwards by Monaghan to the Central Plain ; (3) southwards through the narrow Moyry Pass between Newry and Dundalk to Dublin ; (4) eastwards between the granite Mountains of Mourne and the barren Plateau of Antrim. This corridor is drained by the Lagan to Belfast Lough, at the head of which stands Belfast, the capital of Northern Ireland.

Belfast (415,000) owes its prosperity to the linen trade (for which it has the advantage of excellent spring-water for bleaching), and to its ability to import coal from Ayrshire and Cumberland for its shipbuilding industry (p. 344). In connection with this industry it has developed important rope works ; while its facilities as a seaport, advantageously placed for trade with America, enable it to import tobacco for its tobacco factories. The counties of Down and Armagh have the largest proportion of cultivated land in Ireland. Some flax for the linen industry is grown locally, but more is imported.

EXERCISES III

A

1. On a blank map of Ireland mark and name :
 - (a) Five groups of mountains.
 - (b) The rivers—Shannon, Liffey, Boyne, Blackwater, Foyle, Lee.
 - (c) Loughs Neagh, Derg, Killarney ; Bays—Galway, Dingle, Bantry.
 - (d) Two towns of Northern Ireland ; Dublin, Cork, Wexford, Limerick, Athlone, Waterford.
2. With what parts of Great Britain would you compare the Wicklow Mountains, the Mountains of Mourne, of Donegal, Mayo, and Connemara ; the Antrim Plateau ; the East and West Mountains of Munster ? Give reasons.

3. Write short notes on each of the following : Giant's Causeway, Golden Vale, Rias, Lough Neagh, Bog of Allen, " Solution " lakes, the Emerald Isle.
4. Why are dairy farming and stock-raising so much more important in Ireland than the growing of crops ?
5. On an outline map of Ireland shade land over 500 feet and trace railways from Dublin to Belfast, Galway, Cork.
6. Name areas or towns connected with : marble, brewing, dairy produce, bacon-curing, electric power, rope works, tanning, shipbuilding.

B

1. With so many excellent bays and natural harbours in western Ireland, how do you account for the lack of first-class seaports ?
2. Why is three-quarters of the trade of the Irish Free State with Great Britain, and in which parts of Scotland, Wales, and England are Irish products mainly consumed ?
3. What advantages has Belfast for the industries of shipbuilding, linen, and tobacco manufacture ?
4. Write short notes explaining the geographical advantages of Dublin, Cork, Limerick, Rosslare, Londonderry.
5. Write a short essay under the title—" The Future of Ireland." Keep in view such points as co-operative farming, the benefits of cheap electric power (the harnessing of the Shannon); the possibility of a Union between the Free State and Northern Ireland ; the possibility of draining the bogs ; and the likelihood of creating new industrial centres.

ENGLAND AND WALES

England and Wales have an area of 58,340 square miles and 39,947,000 inhabitants. They may be divided into the three main regions of (1) Industrial England, (2) Metropolitan England, and (3) Wales and South-west England, by a line drawn from Southampton to Birmingham, and an arrow drawn from Berwick to Birmingham, with its barbs passing through Liverpool and Hull (Fig. 84).

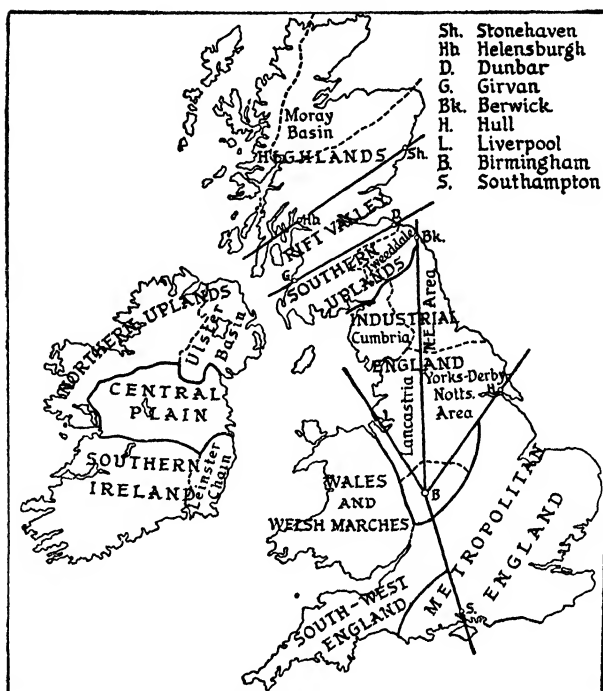


FIG. 84.—Regions of the British Isles.

INDUSTRIAL ENGLAND

(a) THE NORTH-EASTERN AREA

During the period of the earth's history in which coal-bearing rocks were formed, three different beds of rock were laid down in the waters that covered northern England in the following order : (1) Carboniferous (or Mountain) Limestone, (2) Millstone Grit, (3) Coal Measures, which contain the actual coal seams. Pressure from the east then raised up in dome-like form the Pennine Arch, from the top of which erosion later stripped the Coal Measures (Fig. 85). Elsewhere, the Coal Measures were covered by younger rocks, beneath which they are still in part concealed. Changes also took place in the coast-line, partly submerging two coalfields beneath the sea, and bringing three other fields within a few miles of tidal water. When coal began

to be employed on a large scale to give industrial power, but before inland transport was effectively developed, Great Britain was the only country that possessed rich coalfields, the coal of which could be shipped by sea.

At first danger from water and gas confined mining to

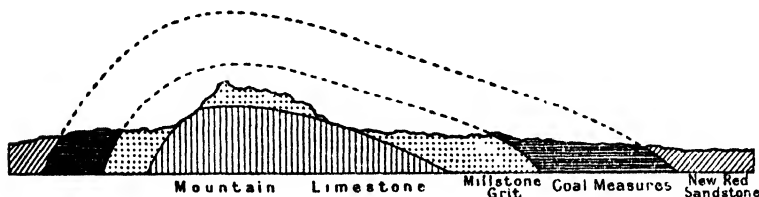


FIG. 85.—Section through the Pennines.

“outcrops” or to seams at very shallow depths. As the demand for coal was not great enough to pay the expense of land carriage until railways were built, the early collieries were all situated within a few miles of the navigable stretches of the Tyne and Wear rivers. The deeper seams of the

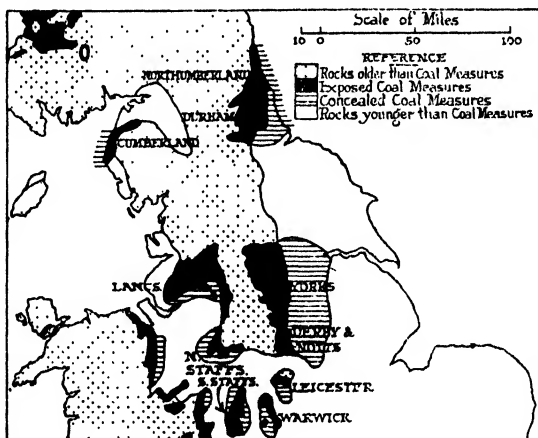


FIG. 86.—Coal-fields of Northern England.

Northumberland and Durham coal-field, and those less convenient for water transport, came to be worked after the opening in 1825 of the Stockton and Darlington Railway, the introduction of the steam pump and modern methods of ventilation and shaft-sinking, and the discovery in 1850

of iron in the limestone Cleveland escarpment, which overlooks the estuary of the Tees.

Although the most accessible Cleveland ores have now been worked out, this north-eastern district still produces about one-third of the British pig iron output (partly from imported ores), and one-fifth of British steel, because of its advantages of local supplies of coal and limestone, the latter being required to "flux" the iron, *i.e.* to separate other mineral matter and to wash out sulphur.

Blast furnaces are concentrated mainly about the lower Tees, in the vicinity of **Stockton** (67,000) and **Middlesbrough** (138,000), and also at Consett and Jarrow. The rock-salt of the Horse-Shoe Plain (p. 322) is mined at Teesmouth as the basis of manufacture of salt, soap, chemicals, and artificial manures. **West Hartlepool** (68,000) is the principal coal-shipping port on the Tees, receiving return freights of Baltic timber, largely for pit props. **Sunderland** (185,000), at the mouth of the Wear, has a coal and timber trade. All the Tyne-Wear-Tees ports specialise in shipbuilding (p. 331).

Newcastle (with Gateshead 405,000) is the business centre of this area. It exports coal, imports timber, and has shipbuilding yards, steel works, engineering shops, chemical and glass works, and flour mills spread along the flats on either bank of the Tyne. It is situated on the north bank of the Tyne, at the lowest point where the river is bridged, and where also the north-south route from the English Lowland to the Scottish Rift Valley is cut by the east-west route from Carlisle through the Tyne Gap in the Pennines. Where this north-south route crosses the Wear, the cathedral city and rock fortress of **Durham** was capital of a border "march" in the Middle Ages.

(b) **CUMBRIA**

The Cumbrian mountains belong to the Cambro-Silurian Uplands, and are connected on the south-east with the Pennines by the saddle of Shap Fell. On all other sides they are surrounded by lowlands—on the south

and west by a relatively narrow strip of coastal plain, on the north by the broader Carlisle Plain, and on the north-east by the Eden lowland, which stretches up the valley of the Eden River to Shap Fell and the Stainmore Pass over the Pennines.

The old border fortress of **Carlisle** (57,000) stands in the middle of a district of mixed farming, and at the junction of routes (1) along the coast, (2) by the Eden lowland, (3) through the Tyne Gap, and (4) from Scotland. It has developed engineering works and the manufacture of fadeless fabrics, furnishing cloths, biscuits, and woollens.

An **industrial area** extends down the west coast as a belt, 10 miles wide, from Maryport to Morecambe Bay. The Cumberland coal-field (Fig. 86) is a relatively small one; a large proportion of the output is shipped coast-wise or to Ireland from Workington, Maryport, and Whitehaven. Iron ore is mined near the coal-field at Cleator, Millom, and in Furness peninsula; but output is decreasing, and Spanish ore is imported for the manufacture of steel rails and for shipbuilding at **Barrow-in-Furness** (66,000).

The mountains and fells of the central highland area are the highest hill district in England, and contain the peaks (over 3000 feet in height) of Scafell, Helvellyn, and Skiddaw. From Scafell river valleys radiate outwards, deepened by the action of ice, and holding, in rock basins or behind dams of glacial drift, the long, narrow lakes which give this area its name of the **Lake District**. Its varied appeal to cragsmen, fell-walkers, and beauty lovers, combining many contrasts of scenery in an area not three dozen miles across, attracts thousands of visitors by road and rail to Keswick, Windermere, Bowness, and Ambleside. Graphite is mined in Borrowdale, and green slates are quarried at Penrith. In addition, the mild winters and moist soil encourage a pastoral industry. The hill slopes are being planted with trees; the high rainfall fills lake reservoirs that supply water by a pipe-line to Manchester. The sheep pastures gave early rise to a woollen manufacture, which still survives in Kendal.

(c) **THE YORKS-DERBY-NOTTS AREA**

The **Yorks-Derby-Notts Coal-field** has the largest coal production in Great Britain (28 per cent. of total output). It has also the greatest possibilities of future development, because to the east of the exposed coal-field "concealed" Coal Measures extend over a considerably greater area than is covered by the "exposed" Coal Measures (Fig. 87).

The British **woollen industry** first became localised in the **West Riding** of Yorkshire because of the water-power of the Pennine streams, the supply of raw wool

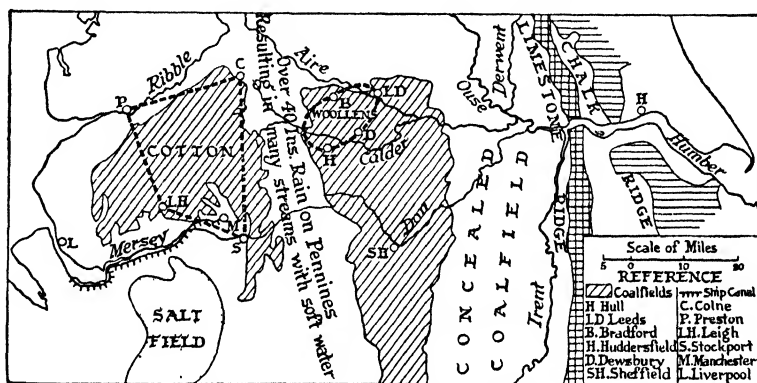


FIG. 87.—Cotton and Woollen Industries.

from sheep grazed on the drier East Pennine slopes, and the soft water from the Millstone Grit rocks of this part of the Pennines (essential for scouring the natural fat from the wool, and for washing, dyeing, and pressing the woven cloth). The fortunate circumstance that power was available from the Yorkshire coal-field, when steam began to replace water-power, increased this localisation, till four-fifths of the total number of workers in this industry are now employed in what is practically a continuous urban area in West Yorkshire. The various processes of the industry are so closely connected that it is necessary they should take place in one neighbourhood. As the first canals and railways were carried across the Pennines by

the Aire Gap, the woollen industry developed in the Aire and Calder valleys.

Within this area there is much local specialisation, **Bradford** (298,000) being centre of the wool-combing and worsted district, **Huddersfield** (113,000) producing woollens and worsteds, **Halifax** (98,000) making carpets, and **Wakefield** (59,000) spinning. **Leeds** (482,000), the route-centre of the district, situated where the Aire Gap opens on to the Vale of York, has wholesale clothing factories, as well as leather, soap, printing, and engineering works.

On the southern part of the Yorkshire coal-field, especially in the Don valley, the manufacture of **steel** centres round **Sheffield** (511,000), which in early times smelted and finished its local iron with charcoal obtained from the forested ridges of its neighbourhood and with water-power from the Pennine streams. The presence of fine grinding-stone directed its energies into the manufacture of cutlery, and, when coal and coke replaced charcoal in manufacturing processes, into the production of fine iron and of special steels, into whose composition enter such metals as nickel, chromium, and manganese. In a half-circle round Sheffield lie the lesser steel towns of **Barnsley**, **Rotherham**, and **Chesterfield**. The power available from the coal-field and abundance of female labour (because the mines can use male labour only) have led to the building at **Doncaster** (63,000) of large mills for the production of artificial silk.

Near the southern margin of the coal-field, **Nottingham** (268,000), at a crossing of the Trent, is a market-town between the coal-field to the north and agricultural areas to the east and south. The coal-field supplies power and the agricultural districts supply raw materials for its tanneries and shoe factories. Smelting of local iron with Sherwood charcoal in the Middle Ages laid the foundations of its modern cycle, motor, and machinery industries; and a local adaptation of the stocking-frame led to its characteristic manufactures of hosiery and machine lace.

Farther west, where the Derwent leaves the Pennines to enter the Trent plain, **Derby** (142,000) has become a route-centre on the railways from Burton to Sheffield, and from London *via* Leicester to Manchester. With Crewe, Doncaster, and Darlington, it takes its place in the chain of "railway towns," with locomotive works, which spreads across the Horse-Shoe Plain.

Development of the Leicestershire coal-field has turned the old county-town of **Leicester** (239,000), on the Soar tributary of the Trent, into the chief centre of the **hosiery** industry, its more "continental" type of climate being better suited for hosiery than for the general manufacture of woollens; while the agricultural resources of the Horse-Shoe Plain have made the city also a centre of boot and shoe manufacture.

About Nottingham the Horse-Shoe Plain curves north between the Northampton Uplands and the southern end of the Pennines, and opens out into the **Vale of York**, which is predominantly **agricultural**. It is the most northerly area of considerable extent in which wheat is a main crop. **York** (84,000), the chief market-town of this area, and the ecclesiastical capital of the North, is important also as a railway junction from its situation at the southern end of the corridor from the English Lowland to the Scottish Rift Valley between the Pennines and the North Sea.

The Ouse, with its tributaries from the Eastern Pennines, and the Trent, which flows across the Horse-Shoe Plain from the Southern Pennines, both enter the North Sea at the gateway cut by the **estuary of the Humber** through the Limestone and Chalk Ridges. Thus **Hull** (313,000) has one-sixth of England and Wales as its natural hinterland. It became the chief place of transshipment to ocean traffic for the water transport of towns on these rivers, to which were added many miles of canals connecting the Yorkshire-Derby-Nottingham coal-field, and even Lancashire, with the port. This water transport was later replaced by railways, and the docks were constructed,

which have made Hull, taking overseas and coast-wise traffic together, third port of the United Kingdom. Its wheat import gives rise to a flour-milling industry, and the requirements of its large agricultural hinterland lead to a great import of oil-seed, for manufacture into cattle food-cake and fertilisers. The oil-seed is also used as raw material for varnishing and paint industries.

Hull has developed industries and commerce as the great port of the Yorks-Derby-Notts coal-field because the Humber, unlike the Thames, affords a route to and from mining and manufacturing England. Grimsby, Goole, and Immingham have in a less degree also become commercial and industrial towns. Both Hull and **Grimsby** (92,000) are fishing ports (p. 329); while **Immingham**, 6 miles farther up the Humber than Grimsby, can accommodate ocean-going steamships too large for Grimsby, and has an import trade in timber, iron ore, and grain, and an export trade in coal and textiles. Scarborough, Bridlington, and Hornsea have changed from small fishing villages to "hotel-towns"—the holiday resorts of the population of the larger cities in their neighbourhood.

(d) **LANCASTRIA**

Hilly country is characteristic of most of the western coast of Great Britain. Between the Lune and the Dee, however, the western arm of the Horse-Shoe Plain reaches the Irish Sea as the lowland of Lancashire and Cheshire (Lancastria). The coast of this lowland is cut by the three tidal estuaries of the Ribble, Mersey, and Dee.

The growth of industries on either side of the Pennines, their extension with the use of water-power almost to the sources of the streams, and the advantage of connecting westward and eastward-facing ports, brought about the construction of canals and railways across the Pennines, which shut in this lowland on its eastern side. On the south there is easy communication by the **Midland Gate**, between the Welsh Highlands and the Pennines, with the English Midlands and the middle Severn valley. Within

this area are the two coal-fields of South Lancashire and North Staffordshire and the Cheshire salt-field.

Upon **South Lancashire coal** is dependent the **cotton industry**. This is the greatest and also the most complex British industry, because all the raw material is imported and four-fifths of the manufactured product is sent abroad. Nine-tenths of the cotton workers of Britain are gathered within an irregular quadrilateral of roughly twenty-five miles by thirty (Fig. 87).

This localisation of the cotton industry is due first of all to climate. The fine cotton filaments become more brittle and liable to break if there is not sufficient moisture in the air. This requirement can be satisfied anywhere on the West Coast as far south as South Wales. The necessity of coal for power, however, meant that the industry had to be situated near either the Lanarkshire, the Lancashire, or the South Wales coal-field. The third of these is of relatively recent development, while Lanarkshire has less good communication with the rest of the country than South Lancashire.

The Rossendale Fells separate the cotton-spinning centres round Manchester, such as **Bolton** (177,000), **Oldham** (140,000), **Rochdale** (90,000), **Stockport** (125,000), Bury, Ashton, Leigh, from the weaving towns in the Ribble valley, such as **Blackburn** (122,000), **Burnley** (98,000), **Preston** (118,000), Nelson, Accrington. The Ribble towns, however, do not restrict their activities to cotton. Coal-mining and engineering take place at Burnley, paper manufacture at Blackburn and Darwen, artificial silk factories and the manufacture of transport vehicles at Preston; while **Blackpool** on the coast acts as "lungs" for the industrial areas of both Lancastria and Yorkshire. **Manchester** itself (766,000) is rather the commercial centre of the whole cotton industry than a manufacturing town.

Until fairly recent times routes from the English Midlands through the Midland Gate led to **Chester**, because the valley of the Mersey was so marshy that the river could

only be crossed at Warrington. The estuary of the Dee was then more important than that of the Mersey. Silting of the Dee, however, led to the rise of **Liverpool** (855,000), on the Mersey, after its estuary had been dredged. Its share in the West African slave trade stimulated importation of cotton by the Triangular Trade Route of the Atlantic; it was also a safer port than London during the Dutch and French wars. Through the cotton industry's dependence upon overseas sources of supply for raw material, Liverpool has come to handle more than one-quarter of the overseas trade of Great Britain. The city thus possesses unique advantages for assembling raw materials, and for marketing at home or abroad the finished products; and its industries all depend on these services rendered by the port—flour-milling, sugar-refining, the manufacture of margarine, oilcake, soap, tobacco, artificial silk, shipbuilding and repairing yards, electrical engineering.

A considerable proportion of the raw cotton imported, however, and wheat, oil, and timber in addition, are not landed at Liverpool, but reach Manchester direct by the **Manchester Ship Canal**, which virtually forms an extension of the dock system of lower Merseyside. Port developments have also taken place at **Birkenhead** (147,000), on the opposite bank of the Mersey from Liverpool, close communication between the two shores being maintained by ferries and by the Mersey Tunnel.

The **Cheshire salt-field** stretches from the Mersey southwards to North Staffordshire, Northwich, Nantwich, and Winsford being the chief centres of salt extraction (Fig. 87). Much salt is shipped from Liverpool. The presence of this raw material has made the district of the middle Mersey the home of **alkali manufacture** in Great Britain. Salt is also the foundation of the manufacture of bleaching products for the cotton industry. The Weaver Canal carries raw and manufactured products from the salt-field to different towns on (or near) the Mersey estuary and the Manchester Ship Canal, such as Port Sunlight, Warrington (79,000), and Widnes (soap), **St. Helens**

(106,000—glass), Runcorn (tanning leather), and Liverpool itself.

The **North Staffordshire coal-field** (Fig. 86) has a roughly triangular shape, with the Pottery towns about the centre, six of these towns having amalgamated to form **Stoke-on-Trent** (276,000). Local rocks yield the clays for the rough earthenware, upon which the industry was first based ; but it was the opening of the Trent and Mersey canal in 1770, connecting Hull and Liverpool with **the Potteries**, that made possible the manufacture of the fine chinaware associated with the name of Josiah Wedgwood, because almost all raw materials (such as china clay from Cornwall) have to be brought from a distance. The coal-field serves not only the needs of the pottery industry, but also an important iron and steel manufacture based on iron mined along with the coal.

The huge local market and the abundance of relatively cheap fertilisers, available as by-products of the local industries, stimulate both **dairying and arable farming** in this western portion of the Horse-Shoe Plain. Lancashire and Cheshire are more heavily stocked with cattle than any other English counties. Potatoes form the chief root-crop, oats (for cattle-feed and straw) the chief cereal. Favourable localities grow vegetables or raise poultry. In addition to feeding the town populations, agriculture also supplies raw materials to such local industries as the tanning works of Runcorn.

(e) **BIRMINGHAM AND THE MIDLAND PLATEAU**

We usually find a dense population about a great seaport, in a wide valley, or in an open plain. It occurs on a watershed only in the case of the **Midland Plateau**, which lies south of the Pennines, east of the Welsh Highlands, and north-west of the Northampton Uplands and the Warwickshire Avon. Industrial development is greatest round **Birmingham** (1,002,000), the commercial, shopping, and intellectual centre of this area, and in the "**Black**

Country " of the **South Staffordshire coal-field** to the north-west, with its lesser centres at **Walsall** (103,000), **Dudley**, **West Bromwich** (81,000), **Wolverhampton** (133,000). All around are industrial towns, **Burton** (brewing), **Coventry** (167,000—cycles, motor-cars, artificial silk), **Redditch** (needles), **Worcester** (potteries), the railway junction of **Shrewsbury**, and **Stafford** (boot-making).

Birmingham is roughly the same distance by rail from **Liverpool** and **Bristol**, and not much more remote from **London** and **Hall**, so that the four estuaries compete for its trade. It stands between the older Industrial England of steel and iron, cotton, and woollens, which manufactures largely for overseas markets, and southern England, with its newer "luxury" manufactures of motor-cars, rubber, artificial silk, ready-made clothing, electrical equipment, wireless apparatus, food and drink, created largely for home consumption.

The chief centre of coal production in South Staffordshire has moved northwards to **Cannock Chase**; and exhaustion of the best coal-seams and the local iron, the competition of foreign centres in steel manufacture, and the disadvantage of having to rely upon rail transport instead of on immediate access to the seaboard, have (as in Switzerland) diverted much of the industrial energy of this area into specialisation in transport vehicles (for which it is naturally suited by its central position in England) and in goods which demand the expenditure of much labour, coupled with artistic and scientific skill, upon a small amount of raw material. As around other areas of dense population, agriculture largely takes the forms of dairying and market-gardening.

EXERCISES IV

A

1. On a sketch map of England add the following details :
 - (a) Shade in the land over 600 feet, and mark the coal-fields.
 - (b) Draw in the rivers Tyne, Wear, Tees, Ouse, Trent, Mersey, Ribble, Lune, Dee, Eden.

- (c) Mark the position of the Tyne and the Aire gaps and the Midland Gate.
 - (d) Mark the position of the following towns by a dot and the initial, thus—L. (Liverpool): Hull, Liverpool, Birmingham, Berwick, Carlisle, Lancaster, Manchester, Chester, Leeds, York, Durham, Sheffield, Doncaster, Preston, Warrington, Crewe, Nottingham.
 - (e) Trace the following lines: (i) L.N.E.R. from Doncaster to Berwick, (ii) L.M.S. from Crewe to Carlisle, (iii) L.M.S. from Leeds to Carlisle.
2. For what are the following districts noted: Furness, Lake District, Cleveland, Tyneside, Vale of York, the Black Country?
 3. From what foreign countries or home areas does Industrial Britain draw the following supplies: dairy produce, wool, raw cotton, iron ore, grain, fresh fruit, oil for soap-making, copper for electrical industry, hides for leather and boot industries, meat?
 4. Give reasons for the Cotton Industry being west of, and the Woollen Industry east of, the Pennines.
 5. What industries have arisen from the following:
 - (a) The presence of salt-beds underlying the Horse-Shoe Plain?
 - (b) The presence of clays in the North Staffordshire Coal-field?
 - (c) Large numbers of cattle in and near the Horse-Shoe Plain?
 - (d) Iron ore, forests, and later the discovery of coal in the Don valley?
 6. Trace the Horse-Shoe Plain on your atlas, and name the ten counties in which it is partly situated.
 7. Explain Woollens and Worsteds, and name manufacturing towns for each. Explain spinning and weaving, and name towns engaging in each.

B

1. Draw a sketch map of the Lake District and insert (a) four peaks, (b) four lakes, (c) four tourist centres.
2. Explain the advantages of traditional skill in industry or commerce from the development of Birmingham, Lancastria, the Potteries.
3. Draw a sketch map of the Humber estuary and surrounding district. Indicate on the map (by arrows or otherwise) the exports and imports of the district.
4. Account for the position of each of the following towns: Carlisle, Newcastle, Middlesbrough, Manchester, Hull, Liverpool, Birmingham, York.

METROPOLITAN ENGLAND

(a) THE GREAT VALE AND THE FENS

In the north-eastern part of the Great Vale the Great Ouse and the Nen flow to the Wash ; its south-western part is the upper basin of the Thames. The water-parting between these two drainage basins lies between Edge Hill in the Limestone Ridge and the Chilterns in the Chalk Ridge. Both the Vale proper and the inward-facing slopes of the uplands, which enclose it, are typically rural, population being gathered in small villages or scattered in farms, engaged in a system of "mixed farming." There is, as everywhere in Britain, a tendency to the gradual increase of pasture as compared with arable. Cattle are specially numerous for dairy produce in the Vale of Aylesbury in northern Bucks, and in Northants in connection with the bootmaking industry of **Northampton** (92,000).

Manufactures, where such exist, are usually of agricultural machinery or of woollen or leather goods, with the addition of motor-cars and artificial silk. The university city of **Oxford** (80,000), **Northampton**, and **Bedford** developed about the head of navigation respectively on the Thames, Ouse, and Nen ; **Lincoln** (66,000) centres on a low gap in the Limestone Ridge ; while Swindon and Wolverton have railway workshops, to serve the needs of the heavy traffic which hurries across this still rural area between London and the industrial districts farther north.

The Great Vale broadens out north-eastwards, and slopes down to the **Fenlands**, which, from a waste of dense sedge, alder, and willow, intersected by sluggish streams, have, by progressive drainage, been changed into the most fertile district of the British Isles. This area has the lowest rainfall in England, and a large percentage of sunshine. Such conditions favour the growth of cereals, especially wheat ; but railway facilities have made potatoes also a leading crop, and both soil and climate are suited to the cultivation of sugar beet. The Spalding area

specialises in the growing of bulbs ; the area round Wisbech specialises in fruit ; while in the Lincoln area peas are extensively cultivated. Towns, such as the university city of **Cambridge, Peterborough**, King's Lynn, are chiefly on the border of the Fens.

(b) THE CHALK RIDGE

The main Chalk Ridge runs as the Western Downs from south-west to north-east as far as Salisbury Plain, then from west to east as the White Horse Hills, and

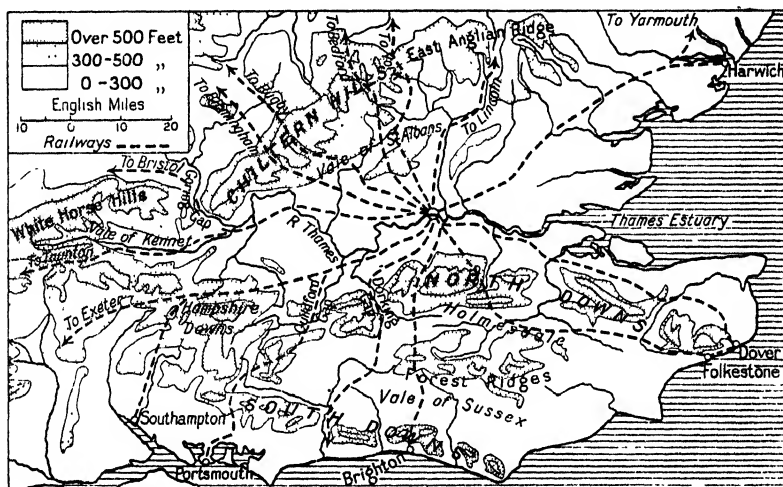


FIG. 88.—The Radiation of Railways from London.

ultimately turns north-eastwards as the Chiltern Hills and the East Anglian Ridge. Between this main ridge and the two lesser chalk ridges of the North and South Downs are three triangular areas—the London and Hampshire Basins and the Weald.

The Thames, the only large river of Metropolitan England, rises in the Cotswolds of the Limestone Ridge, flows across the Great Vale, and cuts through the Chalk Ridge between the White Horse Hills and the Chilterns at the Goring Gap.

North-eastwards of this water-gap, the Chilterns are notched by a series of "wind-gaps," unoccupied by rivers,

and, a short distance south-eastwards, a corresponding series of streams drains to the lower Thames. The original upper courses of these streams formerly flowed through the notches in the Chilterns at a time when the surface of England sloped south-eastwards from the Limestone Ridge, which was then much higher than it is to-day. When the clays between the Limestone and Chalk Ridges were worn down into the trough of the Great Vale, rivers cut valleys more quickly from south-west to north-east along the Vale than did those which flowed from north-west to south-east across it. Thus the upper courses of the south-east flowing rivers were "captured" as tributaries by those flowing south-west (Thame) or north-east (Nen, Great Ouse). The "wind-gaps" of the Chalk Ridge and the water-gap at Goring allow road and rail to spread north and north-westwards from London across the English Lowland (Fig. 88).

(c) THE HAMPSHIRE BASIN

From Jutland peninsula to the Cotentin the European Plain faces the English Lowland. The projection southwards of the Isle of Wight permits a cross-Channel passage, which is only for a short time out of sight of land. Thus from early times navigation was attracted to the deep tidal inlet of the Solent and Southampton Water. The double entry east and west of the Isle of Wight helps to cause the double tides, which maintain continuous high-water for four hours, a factor of immense value for such operations as manœuvring a great liner into dry dock. From Southampton near the head of the estuary, the Itchen Valley leads inland to **Winchester** and thence over the Hampshire Downs to the London Basin. Like Winchester, Salisbury lies near a gap in the chalk escarpment of the Basin; while Dorchester is situated in the south-west, where the clay of the Basin meets the chalk of the Western Downs.

Second port of mediæval England, **Southampton** (176,000) declined when its trade with Venice came

suddenly to an end on the discovery of the Cape route to India. In the railway age, however, the same advantage of time-saving by the overland route, compared with the sea voyage, to London, which had attracted the Venetians to the Solent, made Southampton the foremost passenger port of Britain. In cargo trade it stands third or fourth ; for it has a trade in fruit, vegetables, and flowers from north-west France and the Channel Islands, and also a "transit" traffic in goods railed from the Midlands, or shipped from the Continent, to catch outgoing liners. The extension of electric power and the use of oil have made possible industrial development in shipbuilding, engineering, aircraft manufacture, and in other directions.

On the wider eastern entrance to the Solent, **Portsmouth** (249,000) became the principal naval fortress on the Narrow Seas. Weymouth, Poole, **Bournemouth** (116,000), and Worthing are holiday resorts on the coast. Fruit-growing and market-gardening have developed in this district to supply these local markets.

(d) **THE LONDON BASIN**

The shortest Channel passage, however, is that from the neighbourhood of Boulogne to eastern Kent, where in early times several ports were in use, according to the conditions of tide and weather, Dover being perhaps the most important. From all these ports, land routes converged on **Canterbury**, the starting-point of the Pilgrims' Way to Salisbury Plain and the Roman road of Watling Street. Partly for this reason, Canterbury became, later, the ecclesiastical capital of England.

From Canterbury the road by the North Downs was turned north-westwards towards the Thames estuary by the oak forest of the Weald. The mouth of the Thames in early times was approximately at the position of London Bridge, in the centre of the London Basin ; and here, on the north bank of the river, the first beginnings of **London** were probably made, and later the river was bridged. As ships could pass beneath London Bridge only with difficulty,

London became the head of sea navigation on the estuary. As a seaport London faced the estuaries of Schelde and Rhine, and was the terminus of the ocean ways which converge on the English Channel. It developed in commercial importance after the discovery of the New World and the expansion of overseas trade by the Merchant Adventurers ; and the world's finance began to be centred in the city when the Bank of England and the Royal Exchange were founded.

Two geographical factors, then—(1) ease of communication throughout the English Lowland (p. 368), and (2) the possession of a fine port on the only great river of southern England, and at the centre of the land-masses of the globe—account in part for the concentration in London of a population which for centuries has probably never been less than one-tenth of the population of Britain (4,396,000). To these must be added (3) the freedom from political disturbance, which Britain enjoyed through the supremacy of her navy, and which stimulated the growth of capital and attracted the wealth of continental nations ; and (4) the effect of the Navigation Laws, which restricted England's trade with her colonies to English ships, and brought to London a great entrepôt trade.

More than one-third of the whole external trade of the United Kingdom enters or leaves London Docks ; and half London's exports are entrepôt goods—raw wool, rubber, tea, tin, silk, furs, coffee, chemicals, and the like, brought from all the world's sources of production to London Docks, because from all the world's ports ships are regularly cleared for London, and by ships sailing from London all the world's markets can be served.

These factors, which created a great city on the Thames, have to-day become secondary to the attractive force exercised by this **huge market**, which is also the administrative capital of Britain and the British Empire, a world-centre of finance and commerce, and the greatest manufacturing city in Britain. Engineering, electrical and motor-car manufactures, leather, chemicals, paper, and a

host of other industries are springing up along its railways and new arterial roads. Modern engineering has made possible the supply of vast quantities of water to, and the discharge of equally great quantities of sewage from, the ever-widening area in which the working population of London sleeps, and from which it is carried daily to its labours by electric railways and an intricate system of motor transport.

For the shipping needs of so huge an industrial and commercial centre, the Thames (like the Seine in the Paris Basin) has long ceased to suffice ; and east and south the metropolitan city has developed **outports** for foodstuffs, passengers, and mails at Harwich (for Hook of Holland and Denmark), Queenborough (for Flushing), Dover, Folkestone, Newhaven, Southampton (for France), and Southampton and Plymouth for ocean traffic. From Croydon as an air-port, air routes have been developed, communicating not only with Western Europe, but also with Egypt, 'Iraq, India, and South Africa.

Although vast quantities of food have to be brought from overseas, the first task of **Metropolitan England** is the **feeding of London**, and its second the provision of the essential "lungs" for London's population by the "**hotel-industry**" at holiday resorts. To these needs the different districts round London in varying degrees respond.

The apex of the triangular London Basin—the Vale of Kennet—is essentially agricultural ; and **Reading** (97,000), with its biscuit factories and seed-gardens, stands in the midst of cornland, downland, and water-meadows, at a point where routes spread out to Southampton, Bath, and Oxford. Westward along the Bath road lie Newbury and Marlborough ; between Reading and London are Henley, Great Marlow, and Maidenhead, residential and also summer river-resorts on the Thames.

In the north of the Basin, in the Vale of St. Albans, the clear water of the Colne and locally grown barley were the foundations of the brewing industry of Watford ; while

wheat supplied fine straw for the straw-plaiting manufactures of Luton and St. Albans. Modern industries, such as paper-making, dependent upon imported raw materials, have also developed.

In Essex, **Colchester** grew up as the natural centre of some of the best grain lands in England, linked to the capital by a line of ford-towns (*e.g.* Chelmsford) where the Roman road to Norfolk crossed the streams of the flat coastal plain. The Essex coast provides holiday resorts, as at **Southend** (120,000); while on the southern shore of the Thames estuary minor industries, such as brewing and flour-milling, have grown up on the basis of local agricultural products, with the "**Medway Towns**" (Rochester, Chatham, Gillingham) as chief centre.

In the south-west of the London Basin the sands and gravels of Aldershot form a waste area, which is utilised as a great military training centre, conveniently placed for the defence of London.

(e) **THE DOWNS AND THE WEALD**

Chalk forms a thin soil, which serves only for the growth of pasture grasses and of such trees as firs, whose wide-spreading roots have little hold on the ground. The chalk areas could thus readily be cleared for early settlement, and Winchester became the capital of Saxon England. To-day, however, from their lack of surface streams, they are thinly peopled, except where covered by boulder-clay (which does not extend south of London), or scored by valleys filled with glacial drift. The Downs were great **sheep-pastures** in the Middle Ages, when England occupied the position as a wool-producing country that Australia holds to-day. The South and Western Downs still graze many sheep, though on the latter there is a tendency to replace them by cattle, both for dairy and for beef-producing purposes.

A great dome of chalk once covered the Weald. The inward-facing escarpments of the North and South Downs were then connected by this dome. The top of the dome

was removed by erosion, exposing beds of sandstone, which form the Forest Ridges (Fig. 88), and beds of clay around them, which have been worn down into vales—Holmesdale and the Vale of Sussex. The clay vales have a good water-supply, in contrast to the sands and chalks, which are porous, and do not retain water. Because of this, the favoured sites for early villages were largely in Holmesdale and the Vale of Sussex. Such of these villages as were situated on rivers which breach the chalk escarpments developed, first into market towns (Guildford, Dorking, Maidstone, Lewes, Arundel), and later (especially Guildford) acquired importance from their position on roads and railways between London and the Channel coast. Dover, Folkestone, Eastbourne, and **Brighton** (147,000) are situated where the edges of the ridges that encircle the Weald are cut through by the English Channel.

The whole life of this area has been affected by the influence of London. **Dairy cattle**, to supply milk to the London market, are kept in Holmesdale and round the Forest Ridges. Two-thirds of the **hops** grown, and one-quarter of the whole acreage in Britain under **small fruit** and **orchards**, are in mid-Kent and east Sussex. The coast is fringed with holiday resorts; and from all parts of the area business and professional men travel daily to their work in London by road or rail. Round **Dover** industrial development is beginning on **coal** and **iron** found underlying the chalk, on the general line of the European coal-fields between Belgium and South Wales.

(f) **EAST ANGLIA**

East Anglia (the counties of Norfolk and Suffolk) is a district of low relief, which dips gently eastwards from the escarpment of the Chalk Ridge. Most of this area is covered with boulder-clay, with the exception of the chalk downland of the East Anglian Ridge and Norfolk Edge, and also of northern Norfolk and south-eastern Suffolk, where the glacial deposits are of a lighter, sandier nature, and form "loams." The high daily average of summer

sunshine, the dry spring (due to extension westwards of High Pressure areas from the continent of Europe), and the considerable summer rainfall (p. 324), all favour the cultivation of wheat and barley.

Modern agriculture in East Anglia dates from the Agrarian Revolution in the eighteenth century, when Lord Townshend, Coke, and other landowners introduced into the rotation of crops turnips and clover, which respectively clean the soil and extract nitrogen from the air. With the use of **turnips** as winter fodder the breed of sheep was greatly improved; and roots, sheep (or, in certain districts, cattle), and barley remain characteristic of the East Anglian areas of lighter soil. On the heavier boulder-clay there is mixed arable farming, with a greater proportion of the acreage in **wheat**. East Anglian soil and conditions are also suitable for **sugar beet**.

Industries are mainly those associated with agriculture—the making of agricultural machinery (Norwich, Ipswich—87,000), malting (Ipswich, Woodbridge), the preparation of fertilisers (Ipswich), and the manufacture of boots and shoes, starch, and mustard (Norwich). The **fishing** industry of **Yarmouth** and Lowestoft, like agriculture in East Anglia, serves the needs of London.

WEST AND SOUTH-WEST ENGLAND

(a) WALES AND THE WELSH MARCHES

West of the English Midlands lie the mountains where the Welsh people for centuries maintained their independence. Physically the Welsh Highlands include the hills of Shropshire, Hereford, Gloucester, and Monmouth west of the Severn. This was the border area where were established the English lords of the Welsh Marches. The Highlands proper—or **Welsh Plateau**—fall into four main groups, separated by valleys that afford easy highways: (1) The Snowdonian group in the north-west, which includes Snowdon itself (3560 feet). the loftiest peak in

South Britain, and other summits over 3000 feet, separated by the upper valley of the Dee from (2) the Berwyn Mountains and Cader Idris (2900 feet). This group is divided by the upper Severn and the Dyfi from (3) Mynydd Bach and Radnor Forest ; and these in turn are cut off by the Wye and the Towy from (4) the Brecon Beacons.

Slate is extensively quarried in Snowdonia (Bethesda and Llanberis), and reservoirs have been constructed in that district to supply water to Liverpool and Birmingham ; but the highland areas have too poor a soil and too heavy a rainfall for agriculture. Their westerly position, however, brings a tendency to mild winters, which encourages **cattle and dairy-farming**, especially in the low island of Anglesey and in Herefordshire, and has also caused the growth of holiday resorts on the northern and western coasts, as at Llandudno, Colwyn Bay, Rhyl, Barmouth. The mountain slopes pasture **sheep**, which in the counties of Brecknock, Radnor, Montgomery, Merioneth, Denbigh, reach a density per acre more than twice as great as the average density for England. This in turn accounts for the manufacture of flannel and other **heavy woollen goods** in the upper Severn valley, especially at Newtown. The Plain of Hereford, between the Plateau edge and the Malvern Hills, specialises in **fruit** for the Cardiff market.

While the Plateau is thinly settled, more than half the population of Wales lives in the county of Glamorgan (cf. Lanarkshire, p. 342), on the **South Wales coal-field**, which extends westwards into Pembroke, eastwards to the Forest of Dean. Even in Glamorgan much of the country is still moor and grassland ; and the mining villages are strung out along the railways that run through the narrow, sunless valleys, where the pits are sunk. The first stage in the development of this area was iron-smelting in the north-east. South Wales, in contrast to Birmingham, lacked any tradition of craftsmanship in metals, so that only the preliminary stages of metal manufacture took place locally, the finished products being made elsewhere. This iron-smelting industry has remained centred

round **Merthyr Tydfil** (71,000), but has a tendency to shift to the ports because it has come to depend on imported (chiefly Spanish) ores. Later the construction of canals made it possible to export coal and iron as well as to smelt iron for home use, and docks were built at **Cardiff** (223,000) and Newport.

East of the valley of the Taff, the largest of the parallel streams which cut through the coal-field, bituminous coal is mined. North-westwards of the Taff the coal is richer in carbon, and specially suitable for burning in steamships. West of the Neath valley is anthracite coal. So great a demand grew up for the smokeless steam-coal of the Rhondda valleys, especially for warships, that South Wales was led to export her power instead of using it. The southward slope of the land from the coal-field towards the coast assisted the construction of railways; and harbours developed at Barry and Penarth, while Pontypridd expanded at the junction of ways from the Rhondda district to the Taff valley. After the Great War, however, the increased burning of oil fuel in ships, and the utilisation of hydro-electric power and of their local coal resources, hitherto neglected, by former European purchasers of Welsh coal, deprived South Wales of many of its markets. British coal exports decreased by nearly one-third as compared with 1914; and the chief industry of Wales became faced with collapse and severe unemployment.

The western section of the coal-field has prospects of expansion, which the bituminous and steam-coal districts have not, because of the industrial demand for anthracite and the development of by-product industries, as at Llanelli and **Swansea** (164,000), both centres of copper and tin smelting, and of the manufacture of tinplate.

In **North Wales** there is a small **coal-field** in Flint and Denbigh (Fig. 86), with Wrexham as chief centre, and a mining town at Ruabon. The Flintshire side of the Dee estuary is being drawn into the industrial area of Liverpool-Birkenhead, with metal-working and chemical industries, lead smelting, and the manufacture of artificial silk.

(b) THE ISLE OF MAN

Midway between the shores of England and Ireland the Isle of Man rises out of the Irish Sea. As it is everywhere mountainous, except at the northern end, its population (49,000) is clustered mainly along the coast. **Douglas** on the east coast is the chief port of entry for the tourist traffic, which constitutes the island's most important industry.

(c) SOUTH-WEST ENGLAND

The peninsula which stretches south-westward between the Bristol and English Channels repeats the structure of east to west ridges and valleys already met in south-west Ireland. One ridge runs from the Quantock Hills through the Brendon Hills and Exmoor to Lundy Island ; a second crosses Dartmoor to Bude Bay. Piles of granite blocks, weathered as "tors" into weird shapes, are the most striking feature of the landscape in this southern area. East of this district of highlands and valleys the scenery changes to the "plain" and "down" type of the Midlands and southern England. The Severn enters the wide gulf of the Bristol Channel between the foothills of the Welsh Plateau to the north-west and the Limestone Ridge to the south-east. The valley of the Bristol Avon, which enters the Severn estuary near Bristol between the Cotswolds and the Mendip Hills, gives an important route from this region of south-west England to the Great Vale and the London Basin.

From its south-westerly position oceanic conditions largely control its climate ; and the peninsula experiences moderately warm summers, mild winters, and a fairly heavy rainfall (Figs. 78, 79). Under such conditions rich grass pastures abound for cattle—for the **dairy-farming** which produces Devonshire cream and Cheddar cheese, and for the raising of beef cattle in the more exposed districts of north Cornwall and north and east Devon. The warmth and sunshine ripen **apples** for cider, and **market-gardens**

flourish, growing fruit and vegetables for nearby tourist centres or for industrial districts. The south-west also markets its mild winter climate and the rocky scenery of its coasts in the form of **tourist and health resorts**, such as **Bath** (68,000), Cheltenham, Torquay, Newquay, Ilfracombe, and Lynton.

The mineral history of the south-west is largely a record of decline. The **Forest of Dean coal-field**, though still productive, was of much greater importance in the days when only surface coal-seams could be worked ; and the seams in the **Bristol coal-field** are much broken by " faulting." Tin mining in Cornwall, at its height in the third quarter of the nineteenth century, has collapsed under the competition of the Malay States, as copper mining has done under competition from North America. Cornwall produces granite and slates, and Devon limestone ; but the most prosperous industry is the quarrying of kaolin, or **china clay**, which is obtained from the neighbourhood of St. Austell in Cornwall, and exported *via* the Mersey to the Potteries for the manufacture of china-ware, and to the cotton areas for adding weight and finish in the production of cotton and calico.

On the south coast " drowned " valleys afford fine harbours, such as Dartmouth, Falmouth, and **Plymouth** (208,000), where there is a naval dockyard at Devonport ; and every little inlet has its **fishing** village, with a fleet of small motor-fitted sailing boats. Such villages are less numerous on the north coast, open to the full force of the Atlantic gales (St. Ives, Bideford), than on the south, where Newlyn leads with heavy catches of herring, pilchard, and mackerel, Plymouth and Brixham with sole, plaice, and whiting.

In Somerset, Devon, and Cornwall the main centres of population are either holiday centres or else market-towns and collecting and distributing centres, with small manufactures to meet local needs, such as **Taunton**, **Exeter** (66,000), **Plymouth**, **Barnstaple**, **Truro**. **Gloucester** (52,000), on the Severn, was once the rival of Bristol, but

lost its South Wales trade when the Severn Tunnel was constructed to give a direct route between London and South Wales. It carries on ancient industries of iron manufacture, tanning, and pin-making, and, like the other cities mentioned, is a market-town.

The largest city of this region is **Bristol** (396,000), which grew to importance through its early trade with Ireland and Aquitaine. After the discovery of America it developed its present commerce in (and manufacture of) sugar, cocoa, and tobacco, to which has been added a trade in West Indian fruit (bananas). For the needs of the 6,000,000 people who live within a radius of 75 miles round Bristol, grain, timber, petroleum, oil nuts and oil seeds, and other commodities reach that city from many ports overseas. The importation of beef from Argentina has given rise to a leather and boot manufacture.

The small Bristol coal-field supplies power for the city's industries, and for the ancient West of England "cloth" industry (still preserved in the small towns of the Cotswold valleys), which manufactures the wool of Cotswold sheep. With increase in the size of modern vessels Bristol became at a disadvantage as a port in comparison with Liverpool, because of its situation above the Clifton gorge on the Avon. Docks were therefore constructed below the Clifton gorge at Avonmouth on the Severn estuary.

EXERCISES V

A

1. On a blank map of England mark and name :
 - (a) The courses of the rivers : Thames, Severn, Trent, Ouse.
 - (b) The Weald, Salisbury Plain, Plain of Somerset, The Fens, Vale of Evesham, Snowdon.
 - (c) The railway routes from London to Dover, to Southampton, to Plymouth, to Bristol, to Holyhead, to Harwich ; name one intermediate town on each route.
2. From what areas in England are we supplied with : Hops, cider, cheese, wheat, early vegetables, watercress, kaolin ?

3. Name the ports in the east and south of England which have regular communication with ports on the Continent. Give the names of the continental ports concerned.
4. Name the Irish and British ports between which there are regular sailings.
5. What particular advantages as a seaport has Southampton ?
6. Arrange in order of importance the six principal seaports of England and Wales.
7. Explain the causes which account (*a*) for the past, and (*b*) for the present importance of London.
8. (*a*) Why was the English conquest of Wales easier than that of either Scotland or Ireland ?
(*b*) Why should the great bulk of the Welsh population live in the south ?

B

1. What services does south-east England render to London ? Illustrate your answer by reference to the occupations carried on in Essex, the Vale of St. Albans, the Weald, the Vale of Kennet, and coastal towns such as Brighton.
2. What is meant by "nodality" ? Illustrate your answer by sketches showing the positions of Oxford, Nottingham, Newcastle, London, Dublin, Perth, Glasgow, Inverness.
3. Towns in the central plain of England have outlets for goods at Liverpool, Hull, Bristol, and London. Three gateways lead into the plain. Name them, and say what are the physical hindrances to a fourth gateway in the south-east.
4. Write notes on : Oxford, Stonehenge, "tors," the "Broads," Beachy Head, Epsom, Dartmoor.
5. (*a*) Why did Bristol decline in importance compared with Liverpool ?
(*b*) Connect the growth of its industries with its overseas trade.
6. Is the south of England wholly agricultural ? Locate any industries that exist there.
7. Compare East Anglia with Cornwall and Devon in respect of (*a*) relief, (*b*) climate, (*c*) occupations, (*d*) products.
8. What particular features have made these holiday resorts popular : (*a*) The Isle of Man, (*b*) Folkestone, (*c*) St. Ives, (*d*) Llandudno, (*e*) Keswick, (*f*) Chester, (*g*) Harrogate, (*h*) York ?

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